


POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND

REG'D TRADE MARK MAY BRITAIN, No. 40625



*German Hopper Car
Takes to the River*

—Page 138

In Color

**BUDGET VACATION—
7500-MILE CAMPING TRIP**

For the Craftsman

**FOLD-UP TRAILER
YOU CAN BUILD**



Warning to wives of fishermen and would-be sailors:

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We warn you now—there's nothing quite so irresistible as your first ride with a '58 Evinrude! Nothing is so apt to completely shatter your complacent routine—to propel you into a new world of outdoor activity, family adventure, excitement, fun afloat!

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It's REVELATION RIDE time at Evinrude dealers everywhere! Call your Evinrude dealer now. Look for his name under "Outboard Motors" in your phone book. Catalog free—write: Evinrude Motors, 4266 N. 27th Street, Milwaukee 16, Wis.



happened in America in several decades!

It can happen to you—but that's for you to decide! All we ask is that you discover the pleasure of effortless Evinrude power in the dazzling new Lark or the magnificent V-4 50 hp Starflite. Frankly, you're in for a thrill when you try sound-sealed quiet . . . floating-power smoothness . . . and see the dramatic new jet-sweep styling! Make a date with your Evinrude dealer now for a ride that will be a *revelation* to you and your family!

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You need special spark plugs, too

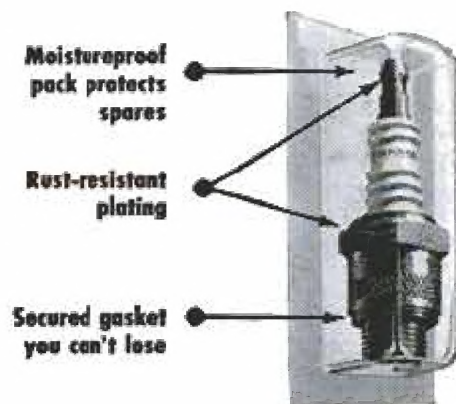
*Always use the spark plugs specially designed for outboards—***CHAMPIONS!**

Outboard motors need special oil—and special spark plugs. Manufacturers know this—and every major outboard manufacturer uses CHAMPION marine spark plugs.

In addition to its regular marine line, Champion now offers you a special marine spark plug with rust-resistant plating to protect exposed metal surfaces. These new marine Champions are sealed in a moistureproof pack that keeps them clean and dry when carried as spares. And they have a secured gasket that can't be lost.

Both have Champion's special "J-gap" electrode design . . . needed for easy starts . . . smooth idle . . . and full power in outboard engines. Both deliver the outstanding performance for which Champion has long been famous . . . performance that made Champion-sparked craft the winners of every event in 27 of 30 major regattas in 1957.

Whichever type you choose, regular or new plated marine, always choose CHAMPIONS—the spark plugs specially designed for outboard motors.



CHAMPION SPARK PLUG COMPANY • TOLEDO 1, OHIO

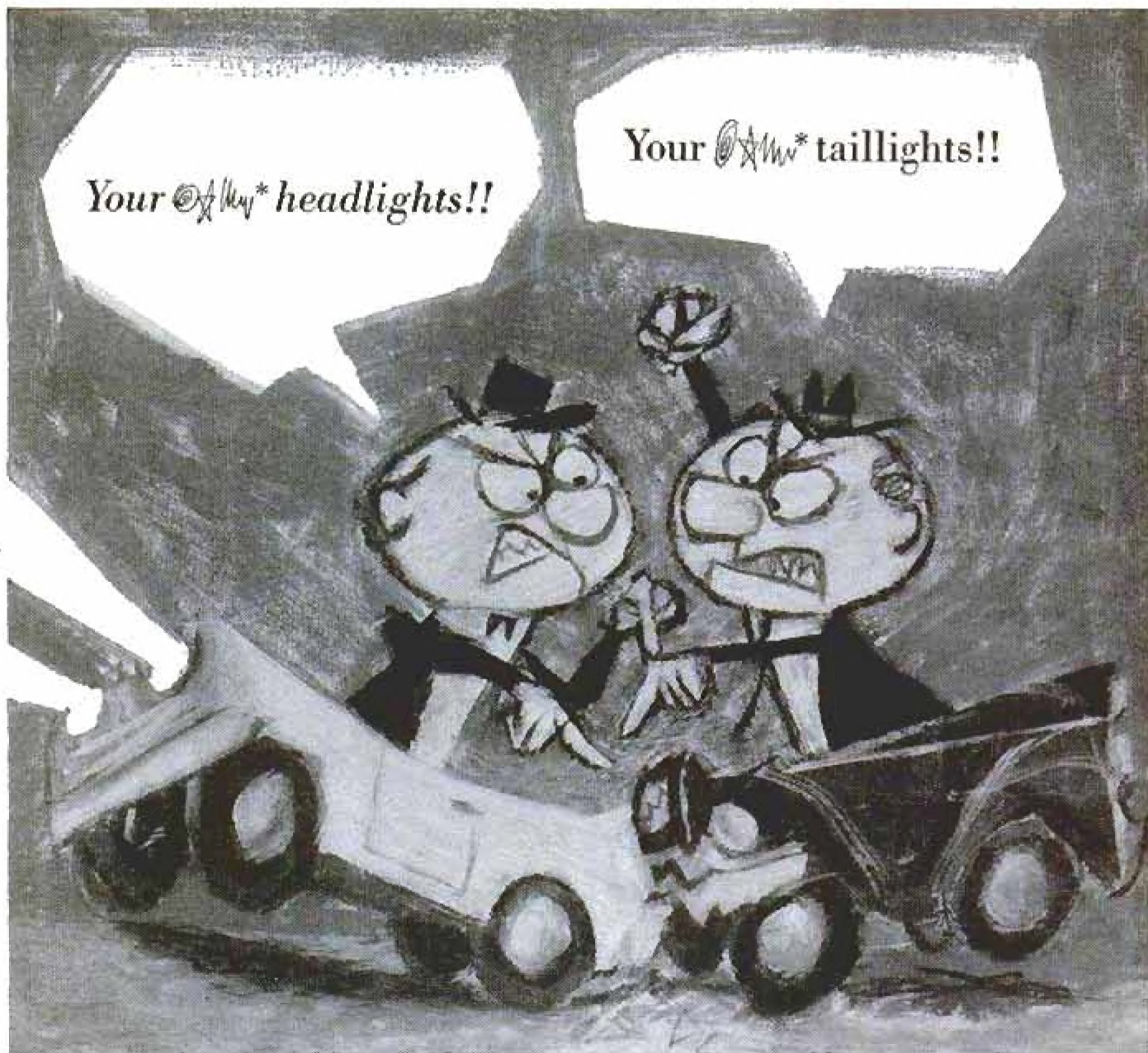
EVERY MAJOR OUTBOARD MANUFACTURER APPROVES—AND USES

CHAMPION

SPARK PLUGS

This One





Before this happens to you:



LOOK AT YOUR HEADLAMPS *in the daytime!* If you see discolored reflectors, or blackened bulbs or droplets of moisture inside the lenses, *you've already* lost much needed light. G-E *All-Weather* Headlamps will give you a lot more light immediately and main-

tain it throughout the long life of the lamps. The reflectors stay bright, moisture can't get inside, they have no inner bulbs to blacken. You see better in rain, fog or snow.

MAKE SURE YOUR HEADLAMPS ARE PROPERLY AIMED!

Headlamps are removable parts, subject to road shock and vibration that can cause them to become misaimed. Aimed too low, you can't see far enough ahead. Aimed too high, the lights glare at on-coming drivers. Your dealer should re-aim your headlamps at least twice a year.



CHECK FOR BURNED OUT REAR LIGHTS! To be seen, make sure your taillights, stop lights, turn signal and license plate bulbs are working. Next time you drive in for gas or a lube job, ask your

dealer to check *rear* lights and replace those that may have burned out with new G-E bulbs. General Electric Company, Miniature Lamp Dept. PM-58, Nela Park, Cleveland 12, Ohio.

**Blankety-blank, that is!*

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Volume 109

MAY 1958

Number 5

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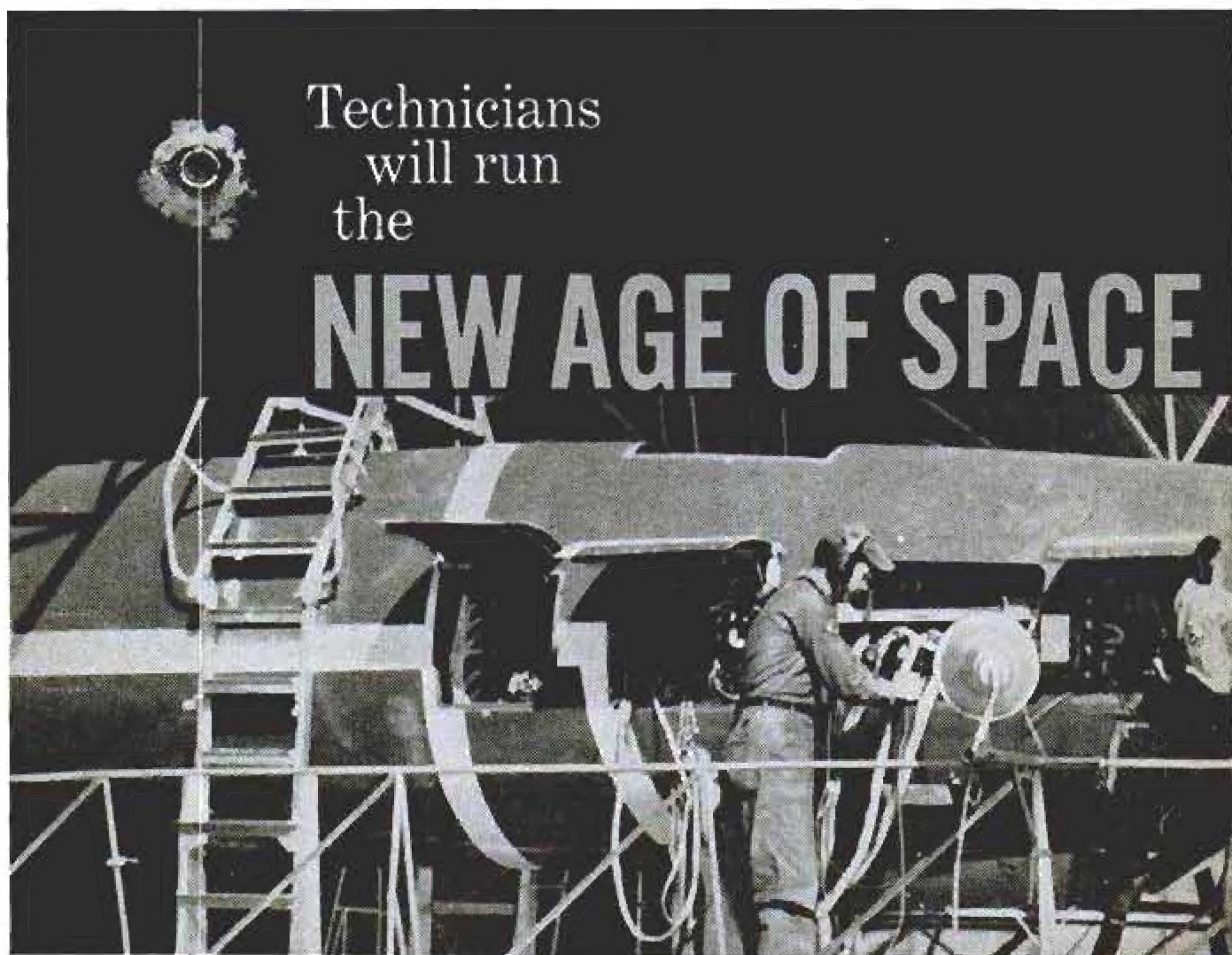
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Next Month...

WHAT'S IT LIKE to live in the vacuum of outer space? The chamber shown here provides part of the answer. Inside this room, a feather will bounce like a rubber ball and a vacuum tube will function without its glass case. Some of the other important problems of space travel are also described in a feature next month





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How a man of 35 can retire at 55 with \$300 a month



"NEVER knew I was a born craftsman until I retired. But, believe me, nothing has ever given me more satisfaction than the first shelves I built with my own two hands. Today I'm working on our hi-fi set. I've been turning out some really beautiful furniture in my basement workshop. But if it weren't for that \$300 check each month, I'd still be at the plant worrying about production figures.

"In a way, I have my father to thank that I'm retired at 55. Twenty years ago we were right in the middle of the depression. My father had always hoped to retire at 65, but when the time came, he hadn't saved enough. I was 35 then. My job promised a good financial future, so I went from day to day without thinking ahead.

"Then one day my father pointed out that he had had the same kind of promising job when he was my age. He and my mother lived comfortably, sent us children through

college, traveled. Somehow the money went as fast as it came in.

"I began to think seriously. With a wife, two children and a third on the way, I hadn't saved much. As the children grew older, expenses would go up. And even if I were able to save, I might outlive my savings.

"I read everything I could on ways to retire. One day I saw an ad for a plan that seemed different—the Phoenix Mutual Retirement Income Plan. Provided I started young enough—and I was definitely young enough—this plan could provide an income from \$20 to \$300 a month for life.

"I clipped the coupon and sent for the booklet. I discovered I'd be able to retire at 55, ten years earlier than the age my father had suggested. That fact was enough to make me decide on Phoenix Mutual, but I carefully compared it with other plans. It was still Phoenix Mutual for me.

"That was only twenty years ago—twenty short years of feeling secure about my future. When my first check for \$300 came, I retired. I've started a new career in my workshop—my secret ambition for years."

Send for Free Booklet

This story is typical. Assuming you start at a young enough age, you can plan to have an income of \$20 a month to \$3,600 a year or more—beginning at age 55, 60, 65 or older. Send the coupon and receive, by mail and without charge, a booklet which tells about Phoenix Mutual Plans. Similar plans are available for women. Don't delay. Send for your copy now.

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ACROSS THE DESK



To the Editor:

This is our version of the *Sea Knight* from plans published in *PM* (May 1957). We have enjoyed several cruises down the Yazoo River.



It is completely glass-fiber covered for minimum care and upkeep.

We had been looking for a boat of just the right design for a long time, and this is it.

W. D. Carter,
Carter Building Service,
Yazoo City, Miss.

☆ ☆ ☆

To the Editor:

I've just finished reading "Detroit Listening Post," in your February issue and, as usual, I was enchanted.

However, could I take exception to a sweeping generalization on page 288? There you indicate that the American auto industry has a tendency to look on increasing sales of foreign cars as a "fad."

Please omit us out, as Sam Goldwyn might say.

Last November, speaking to members of Sigma Delta Chi in Cleveland, Mr. Walker had something to say on that subject. I enclose a copy of his remarks.

George A. Haviland,
Public Relations, Styling Center,
Ford Motor Company,
Dearborn, Mich.

EDITOR'S NOTE: Here is an excerpt from the speech by George W. Walker, Ford vice-president and director of styling:

"I don't think small foreign cars are a fad. I believe they'll always be with us. The only conclusion we can reach is that American and foreign cars must coexist. Each fills a particular need."

(Continued to page 8)

Satisfied with my PRESENT PAYCHECK? **NOT ME!!**



TODAY, you are probably earning enough to get by—enough to provide your family with life's necessities, and perhaps you are depositing a few extra dollars in the bank.

BUT are you content with just earning a living wage? Do you say "Someday I'll really get a break and go right on to the top." THAT'S WISHPFUL THINKING!

You know that the "breaks" go to the man or woman who is *prepared* to take advantage of them—to the person who can fill the better job and who is worth more money. He makes the "breaks" instead of waiting for them.

DO YOU QUESTION YOUR OWN ABILITY?

There is a field of business which has never been overcrowded—it's the ACCOUNTING FIELD. And the demand for skilled accountants—men and women who really know their business—is increasing. State and Federal legislation requires much more efficient accounting from business. Corporations are in constant need of expert counsel in matters relating to Auditing, Cost Accounting, Business Law, and Federal Income Tax. Men who prove their qualifications in this important branch of business are promoted to responsible executive positions—given an opportunity to earn real salaries. The range is \$5,000 to \$10,000 a year—even to higher income figures.

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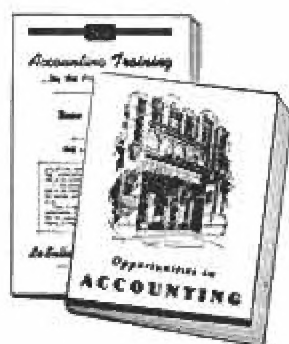
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Name.....Age.....

Address.....

City, Zone, State.....

(Continued from page 6)

To the Editor:

Many thanks for the article in your very popular *Popular Mechanics* (Feb., page 128). We deeply appreciate your interest in us, our birds and our cheetahs. The popularity of your magazine has been proved to us in letters from all over the country as well as India, the Philippines, England and Southern Rhodesia.

John N. Hamlet,
Birds of Prey, Inc.,
Ocala, Fla.

☆ ☆ ☆

To the Editor:

I would appreciate it if you could correct a misquote in the piece about the Thompson harp (March, page 286). My sentence was: "The large modern concert harp, six times heavier, produces a tension of only 700 pounds more." The tension of the concert harp is about 2000 pounds, not 700 as was stated in the magazine.

Cecelia Lee Fine,
Washington, D. C.

☆ ☆ ☆

To the Editor:

I am enclosing a photograph of a friend, Clarence (Connie) Gosnell, of West Terre Haute, Ind. Connie is a World War I veteran and a retired coal miner, aged 60.

Connie is gradually losing the use of his

legs. He can walk a little with the aid of two canes and much physical effort.

His 80-year-old mother pushed him in his wheel chair to my garage and general repair shop and asked me to install some

(Continued on page 10)



Engineer with a tough hair problem. Chemical Engineer Al Judson is troubleshooter at a giant Houston, Tex., plant. Sun, wind, steam mess up his hair.



He licks it with Vitalis. To keep his hair looking neat when he's back at the lab—or out in public—Al always uses Vitalis Hair Tonic with greaseless V-7.

New greaseless way to keep your hair neat all day...and prevent dryness

Whether your hair takes a beating from sun or morning showers, you'll like the way Vitalis keeps it in condition . . .

prevents dryness. Your hair never has a greasy look because Vitalis grooms with greaseless V-7. Use Vitalis every day.

New VITALIS® Hair Tonic with V-7®

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POPULAR MECHANICS



"HOW A 'CRAZY RUMOR' GOT ME PROMOTED!"



What I overheard one morning shook me right out of a rut!

"Company's getting ready to cut back . . . bound to be layoffs," I heard them say. "Just another crazy rumor," I told myself.

Just the same, I took quick stock of myself that night. Came up with four good reasons why the company would keep me on:

- Three years' experience*
- Getting along with foreman*
- Turning out acceptable work*
- Prompt and dependable*

And four just-as-good reasons why they might let me go:

- Making no real headway*
- Others better qualified*
- Still rated "semi-skilled"*
- Needs special training*

I wasn't in trouble. But I sure wasn't "in solid" like I should be. That's when I made up my mind to enroll for training with I.C.S.

I picked I.C.S. because it's the oldest and largest with 257 courses. The training is quick and thorough. It's recognized by my company and accredited by the National Home Study Council. You study in your spare time and get personalized, practical instruction—know-how you can apply next day on the job.

That was a year ago. There have been two layoffs since then. While some of the others were just hanging on or being released, I was moving up. My I.C.S. training started something. Not only did it get me promoted (with a fat pay hike), but it put me in line for real advancement.

Don't wait for a "crazy rumor" to set you straight. Take out your "job insurance" right now. Mail the coupon and get full, free details on how I.C.S. has helped thousands, how it can help you. No obligation—and you get three valuable books *free!* (1) How to Succeed; (2) Catalog of opportunities in the field of your choice; (3) Sample lesson (math).

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- ☐ Construction Engineering
- ☐ Highway Engineering
- ☐ Professional Engineer (Civil)
- ☐ Reading Struc. Blueprints
- ☐ Structural Engineering
- ☐ Surveying and Mapping

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- ☐ Architectural Drafting
- ☐ Drafting Machine Design
- ☐ Electrical Drafting
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- ☐ Sheet Metal Drafting
- ☐ Structural Drafting

ELECTRICAL

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- ☐ Industrial Metallurgy
- ☐ Industrial Safety
- ☐ Machine Design
- ☐ Machine Shop Practice
- ☐ Mechanical Engineering
- ☐ Professional Engineer (Mach)
- ☐ Quality Control
- ☐ Reading Shop Blueprints
- ☐ Refrigeration and Air Conditioning
- ☐ Tool Design
- ☐ Tool Making

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- ☐ Industrial Electronics
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- ☐ Practical Telephony
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- ☐ Diesel Engr. and Fireman
- ☐ Diesel Locomotive

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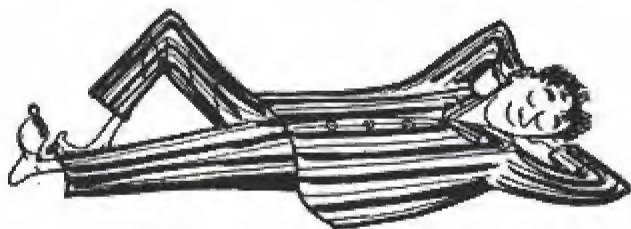
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(Continued from page 8)

form of motor on it. At my suggestion he investigated the power mower shown in the picture. He purchased the machine, equipped with friction power train forward and reverse. I removed the cutter blade and installed a flywheel in its place. It serves as a self-propelled wheel chair. I also made some other changes to enable him to lift his leg across.

The local license-bureau representative came to his house and tested his ability to maneuver the vehicle and issued him a driver's license and a motorcycle license. Now he can get around under his own power.

Will Kersey,
West Terre Haute, Ind.

☆☆☆

Modern Versus Traditional

Architects and builders (along with our several million readers) will be interested to know that the public taste in houses—at least in regard to the PM Traditional and PM Modern featured in the October 1957 issue of *Popular Mechanics*—is just about



Modern (above) and traditional



50-50 when it comes to preference in traditional versus modern design. This may surprise a lot of people, especially the deans of architectural schools which teach only modern design. Five months after publication of our October Home Section we had received 611 inquiries on the PM Traditional and 601 on the PM Modern.

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Pebble People

Gus K. Bowman, advertising-agency executive in Columbus, Ohio, started carving pebble people several years ago. At first he used an assortment of files—a slow, tedious method.

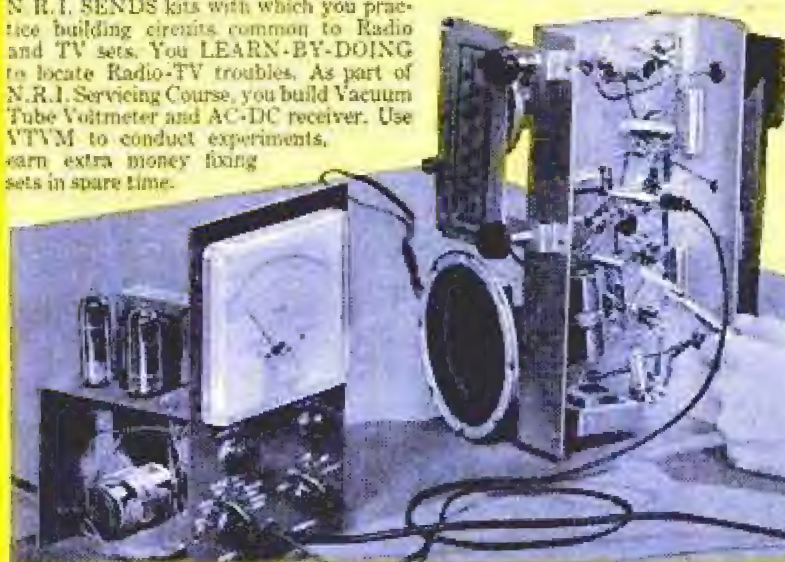
Then, one day as he sat in his dentist's

(Continued to page 64)

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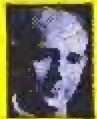
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"There are a number of NRI graduates here. I can thank NRI for this job." **JACK WAGNER,** Lexington, N. C.



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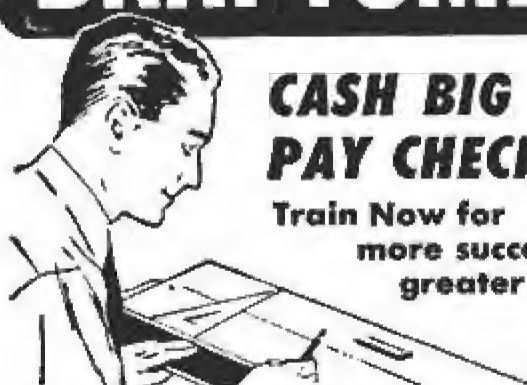
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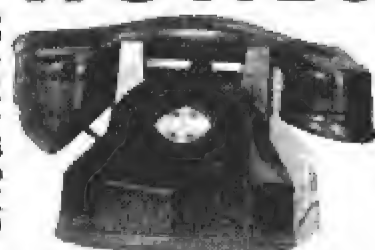
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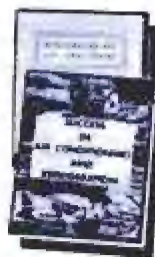
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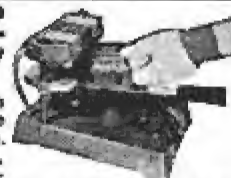
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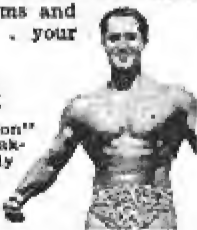


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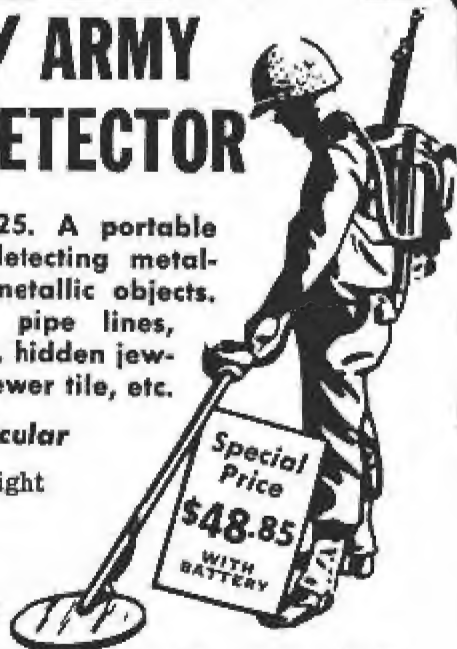
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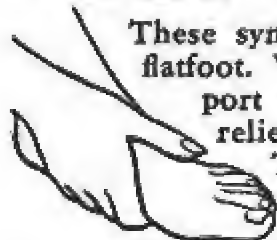
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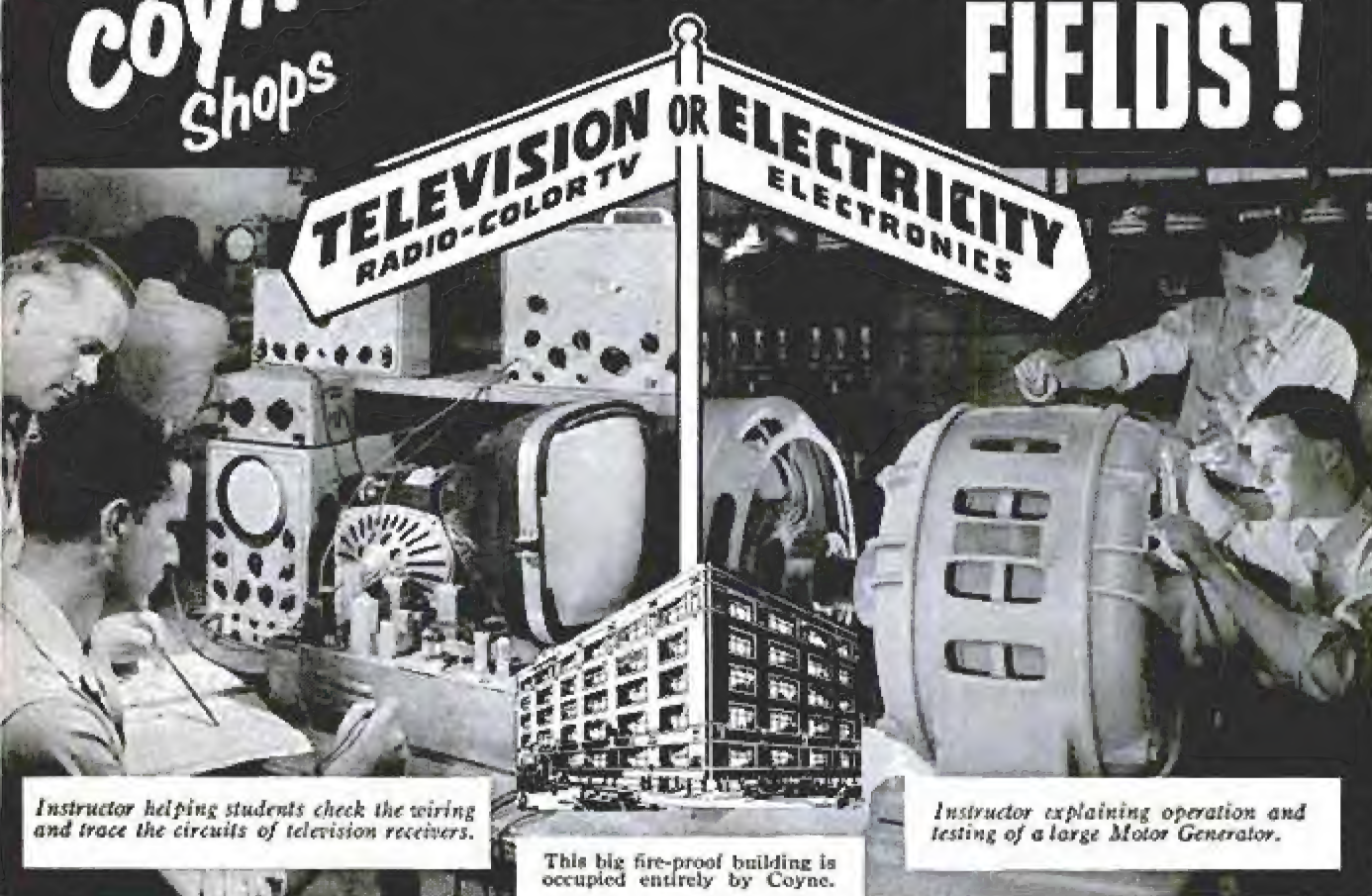


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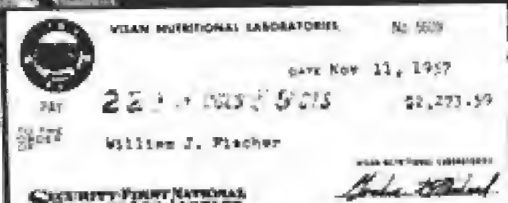


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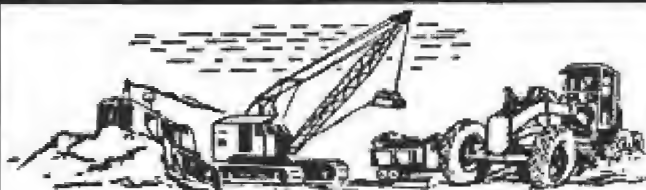
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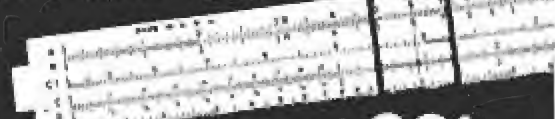
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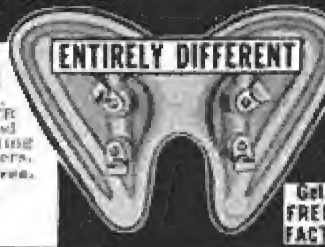
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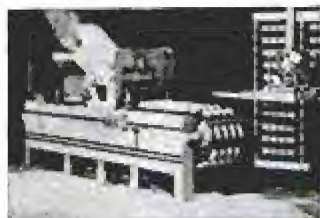
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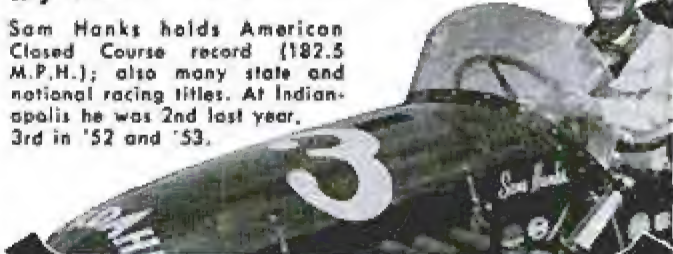
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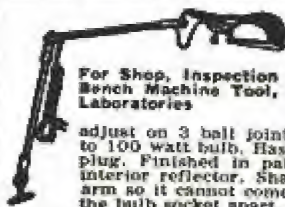
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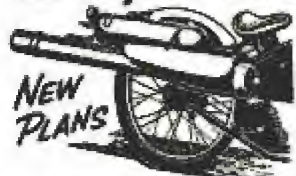
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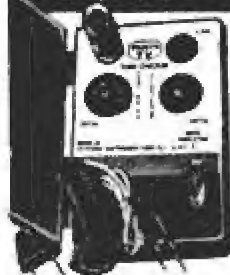
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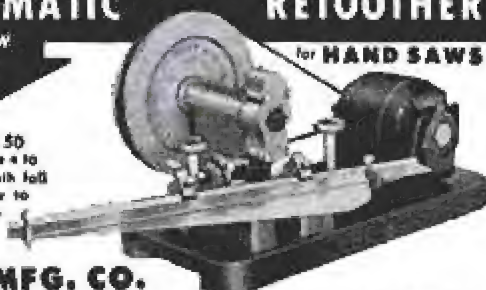
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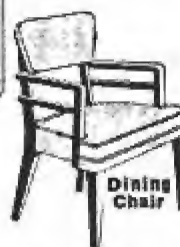
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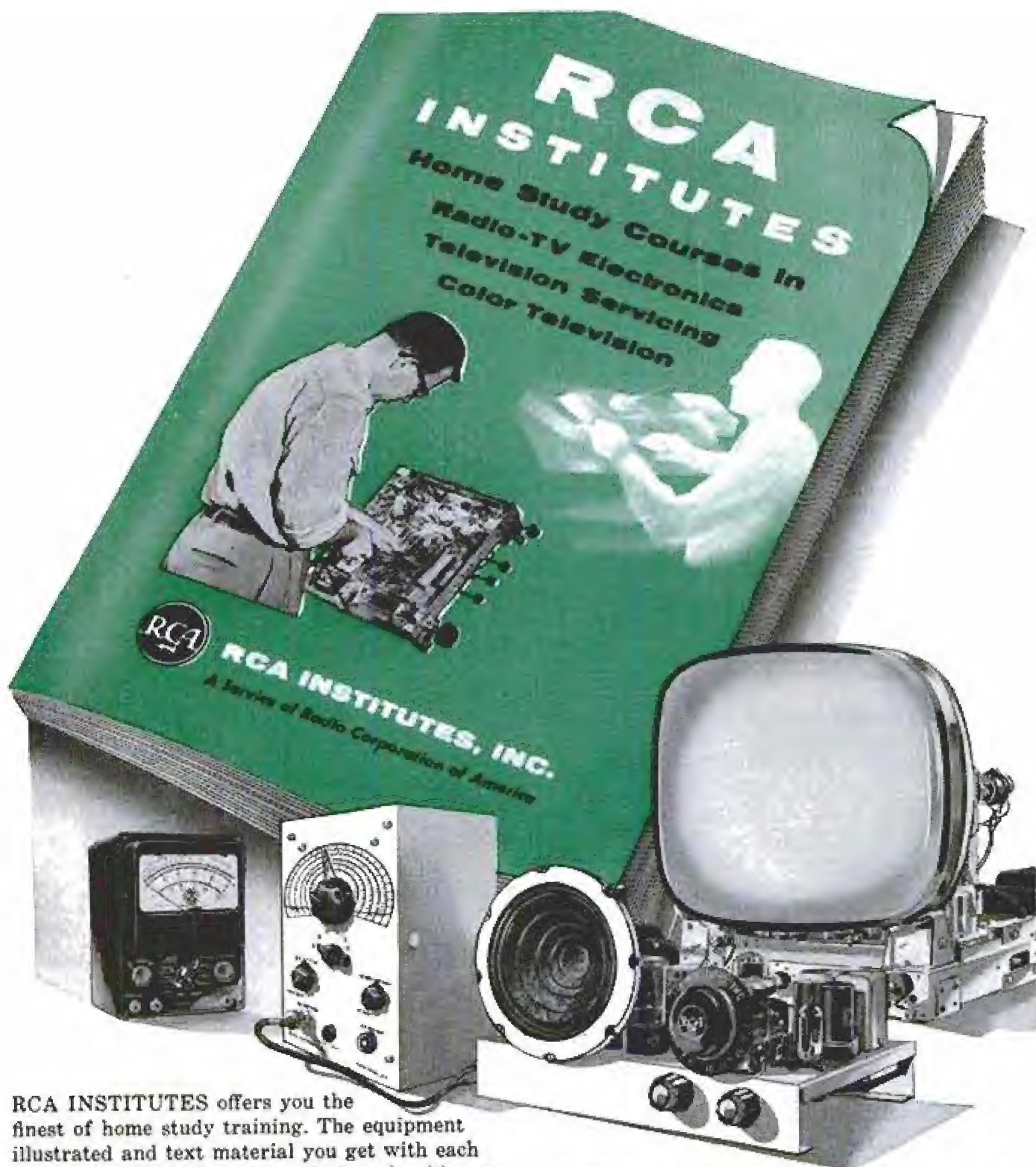
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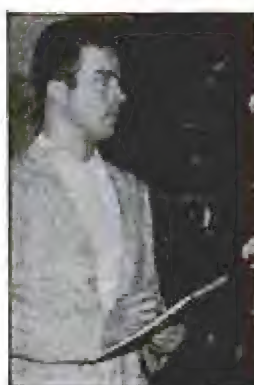


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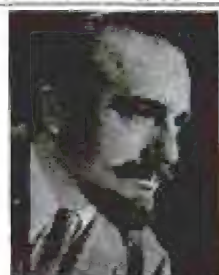
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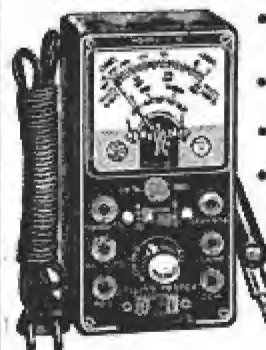
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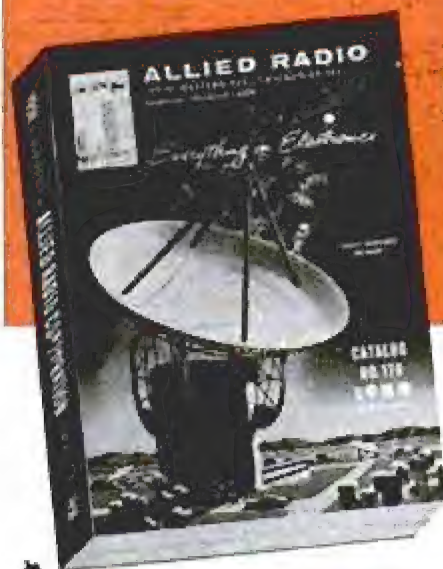


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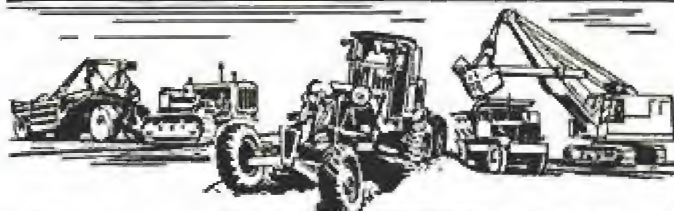
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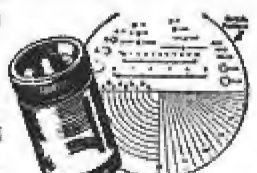
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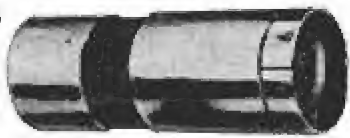
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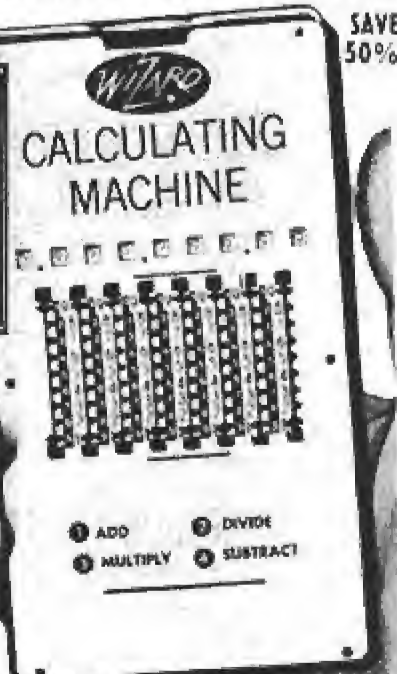
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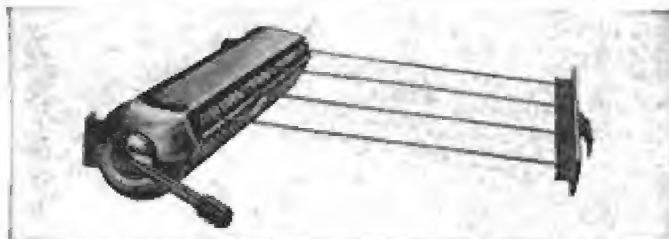
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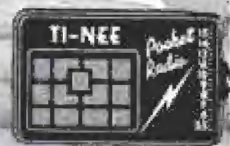


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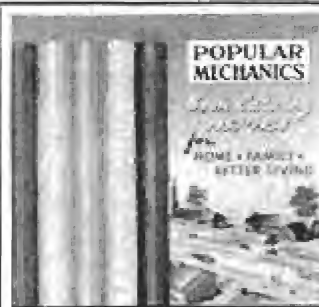
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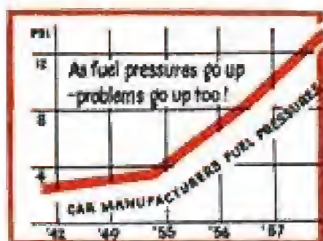
- Read Here How the New Improved Mileage Minder Unconditionally Guarantees More Power, Better Performance, Greater Gas Mileage.

Most of the troubles that plague modern cars are directly traceable to the fuel system. As motors have become more and more compact and complicated, the demands of the fuel system have become greater and greater. Fuel pumps and carburetors have also become more complicated and delicate. The fuel pump advances the gasoline from the gas tank to the carburetor in pulsating surges created by the cam action of the pump. In turn, the carburetor admits gasoline through a brass orifice, which is opened and closed by a steel needle, which is controlled by the action of a float-bowl.

More Complex Cars ... More Problems

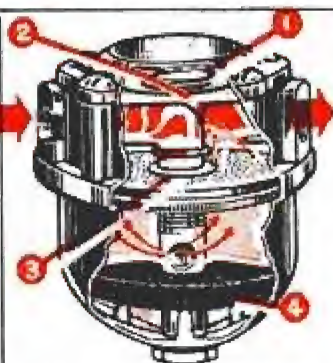
In early engines, when fuel pressures were low and engines far less complex, the problem was not nearly so serious because we simply didn't expect the same performance that we do now.

Now, however, automotive fuel systems have become extremely complex, expensive and as delicate as a Swiss watch. Fuel system pressures have increased to the point that many cars demand fuel pressures of six, seven and even eight pounds per inch, where before only two pounds or even less were required.



These extreme pressures are necessary for the performance of the engine, BUT what has happened is this: the fuel pump hammers the gasoline in pulsating surges, at pressures five or six times higher than before. The impact of these pressure thrusts has become so violent an audible knock is often heard.

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2 Mileage Minder's pressure chamber principle positively traps vapor-locking gasses, which cannot pass on through the fuel stream until condensed and liquefied.

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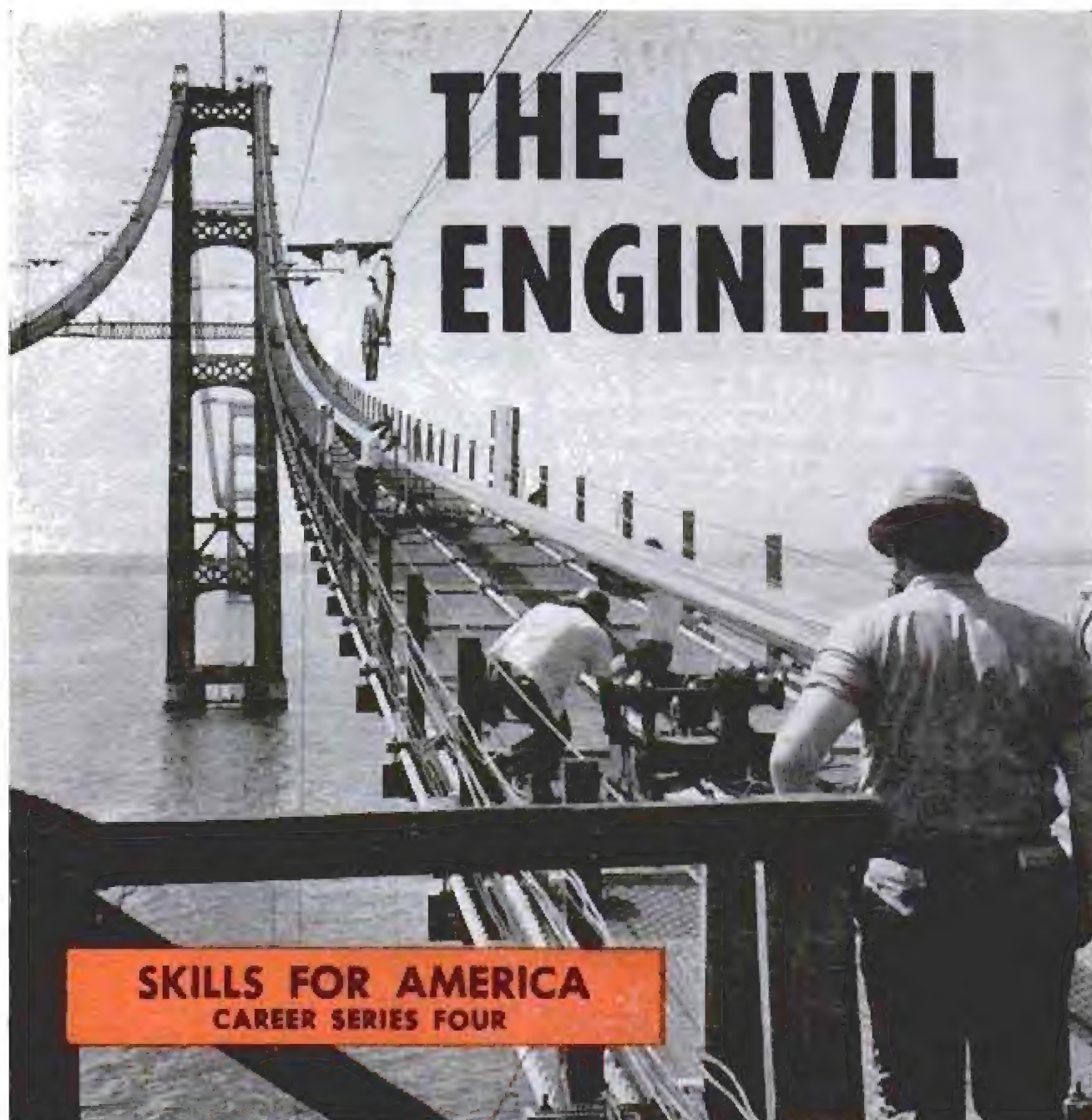
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Engineering has been called the art of making pure science useful. It is an art almost as old as man himself. Perhaps the first true engineer was the caveman who used a limb as a lever to roll a stone in front of his cave. Throughout history, man has built all his works upon the foundation laid by the engineer. He is the architect of civilization.

Today there are numerous branches of engineering. Civil engineering is one of the two largest branches. In the planning of any large project, the civil engineer is

consulted first. All that follows is built upon his work.

His office is the world. At this moment a young engineer is laying a new pipeline across the oil-rich soil of Venezuela. Another is supervising mining operations under the rim of the Arctic Circle. A third is trying to strait-jacket Old Man River to prevent floods. A fourth is laying out an airfield in the jungles of Africa.

The civil engineer can select his own type of work. He can design and build dams, bridges, railroads, water-supply systems and superhighways. He can be the key figure—the City Manager—in municipal government. He can work for a state or federal agency. He can move into financial circles, appraising commercial properties for real-estate and insurance firms. He can go into business for himself as a consulting engineer. He can teach. He can work indoors or out, anywhere in the world.

According to the U. S. Department of Labor, the employment opportunities in this field are very good, and the outlook is for continued growth. Recently a vast highway-construction program, extending years into the future, was voted by Congress. The explosion of the birth rate throughout the world will require vast new water, sewerage and irrigation systems. Today's intolerable traffic problems will have to be solved. Air safety, flood control and city planning are tremendous challenges. Progress in all these fields will depend upon the work of civil engineers. The opportunities are unlimited.

Even further, this is a field for real and rapid advancement. At one time, the young man who was determined to reach the top in a large corporation went into law or business. Today the presidents of a surprising number of large companies are civil engineers. Of all the engineers in this country, more than 30 percent are in administrative or management posts.

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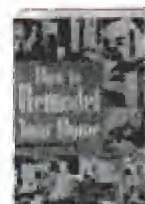
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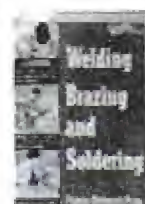
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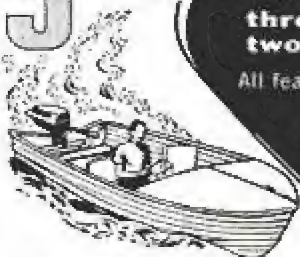
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A feature article in the April '57 issue of Popular Mechanics Magazine describes some of the truly amazing properties of the new "magic" chemical—Gibberellin. Botanists have been unable to determine the exact chemical composition of this "miracle" substance, but one thing is certain—"It will create a plant revolution."

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(Continued from page 10)

chair, eyeing the drill with distaste, the big idea came. He soon acquired a small hobby tool and a selection of dental abrasive wheels. With their help, his carving



Bowman uses dental disks to carve his pebble people

went much faster and he has been able to add several dozen one-of-a-kind specimens to his collection. His carvings range in size from $\frac{3}{4}$ inch to eight inches.

Bill Arter,
Worthington, Ohio.

☆☆☆

To the Editor:

The article in your January issue captioned, "The Battle of Donner Pass," caused quite a bit of concern in Plumas County, especially paragraph six, which stated that . . . "there is often only one practical detour to the Coast, via southern California, 300 miles to the south."

Needless to say, we were greatly disturbed because U.S. 40 Alternate, the Feather River Highway, is the lowest, snow-free highway across the Sierra, and the only practical route to the coast during the winter months. The highest point on U.S. 40-A is only 5212 feet, approximately 2000 feet lower than Donner on Highway 40. Each time Highway 40 is closed for any reason, all traffic is routed over U.S. 40 Alternate. On January 27, 1958, the snow pack on Highway 40 at Donner Pass was 54 inches. On the same date we took pictures of Beckwourth Pass, the highest point on U.S. 40 Alternate. It was snow-free.

(Mrs.) Ruth Rees, Secretary,
Plumas County Chamber of Commerce,
Quincy, Calif.

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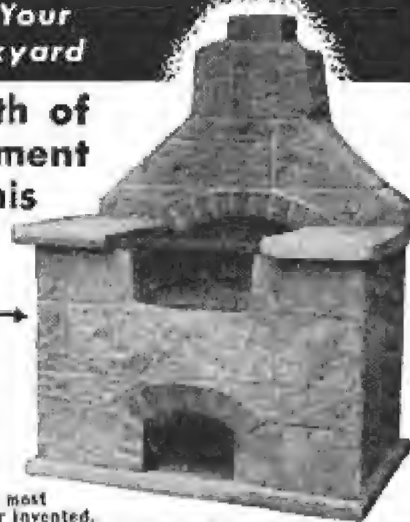
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Pittsburgh man

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COST**

of new shingle
roof with

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Mr. Tanzillo brushes on a new, metallic green roof, saves cost of shingle job. Sipes Luma-Tint Colored Aluminum Paint is made by James B. Sipe & Co., Pittsburgh, Pa.

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This heavy-bodied coating stopped the leaks—and his wife likes the pretty green metallic color. She says they have a new roof. Luma-Tint Colored Aluminum Paint is great for vertical surfaces, too. The Tanzillos used it on a cinder block garage and sheet metal tool shed. The change was amazing. The whole place looks better.

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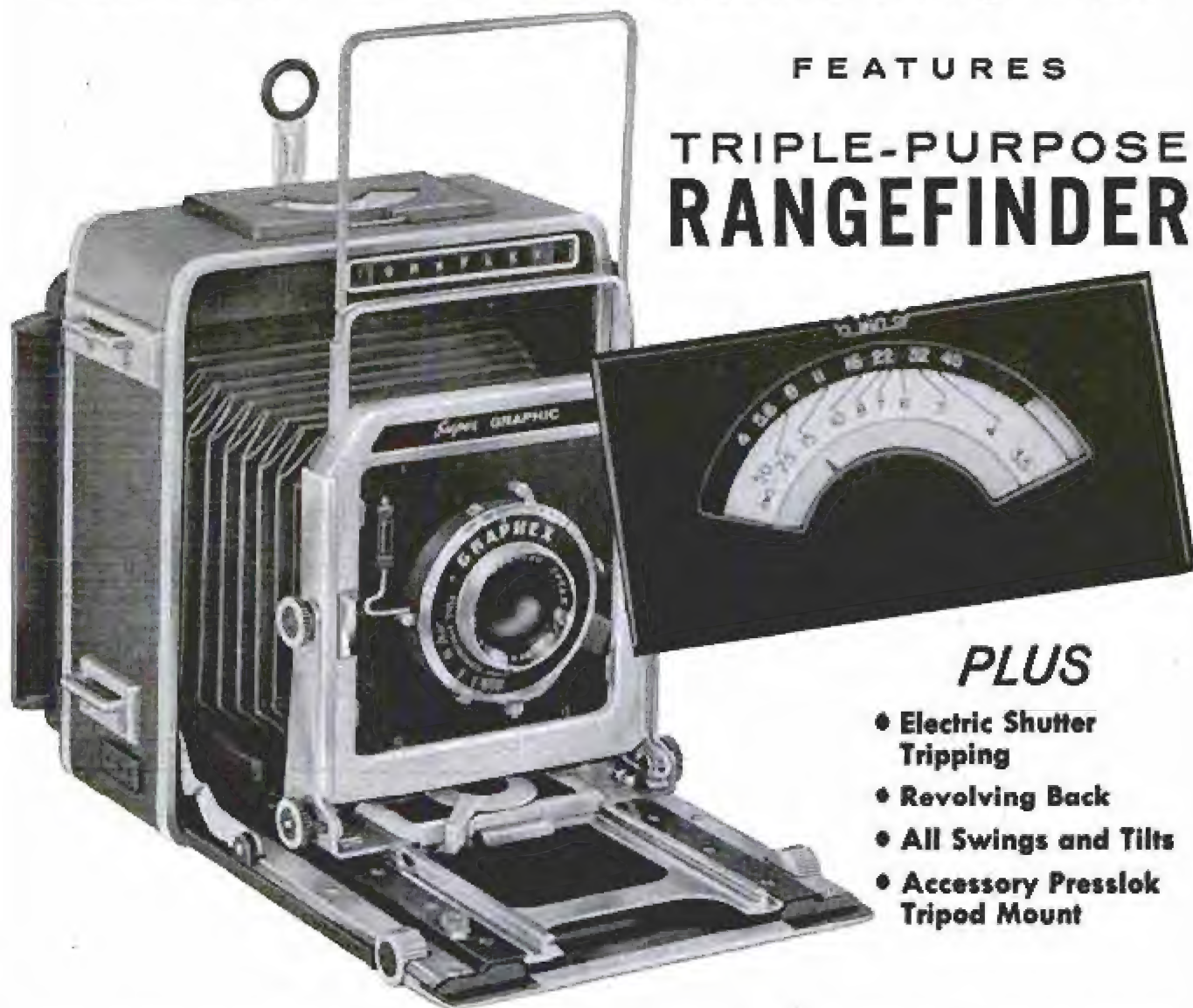
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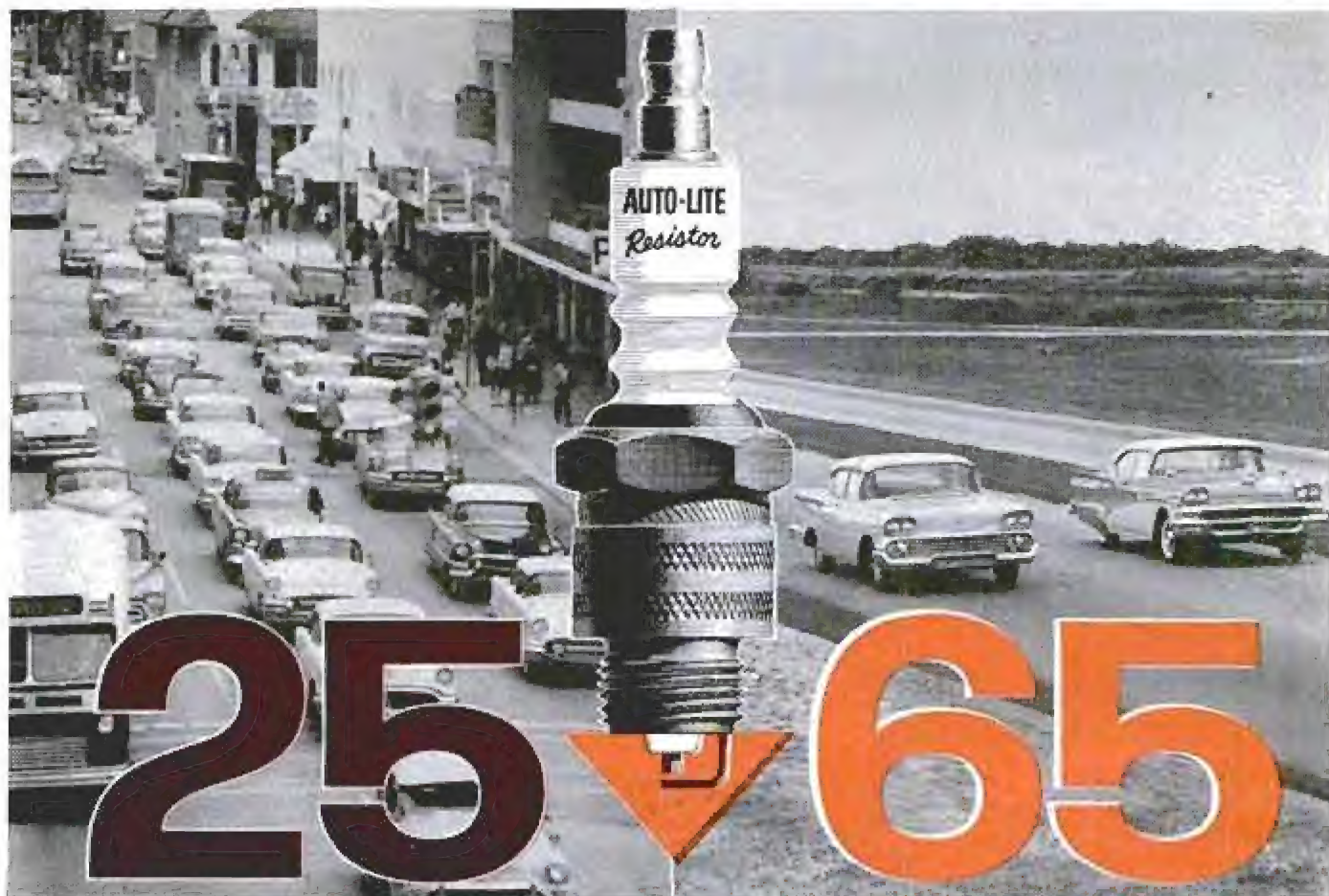
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Build-It-Yourself Airplane Cruises at 120 Miles Per Hour

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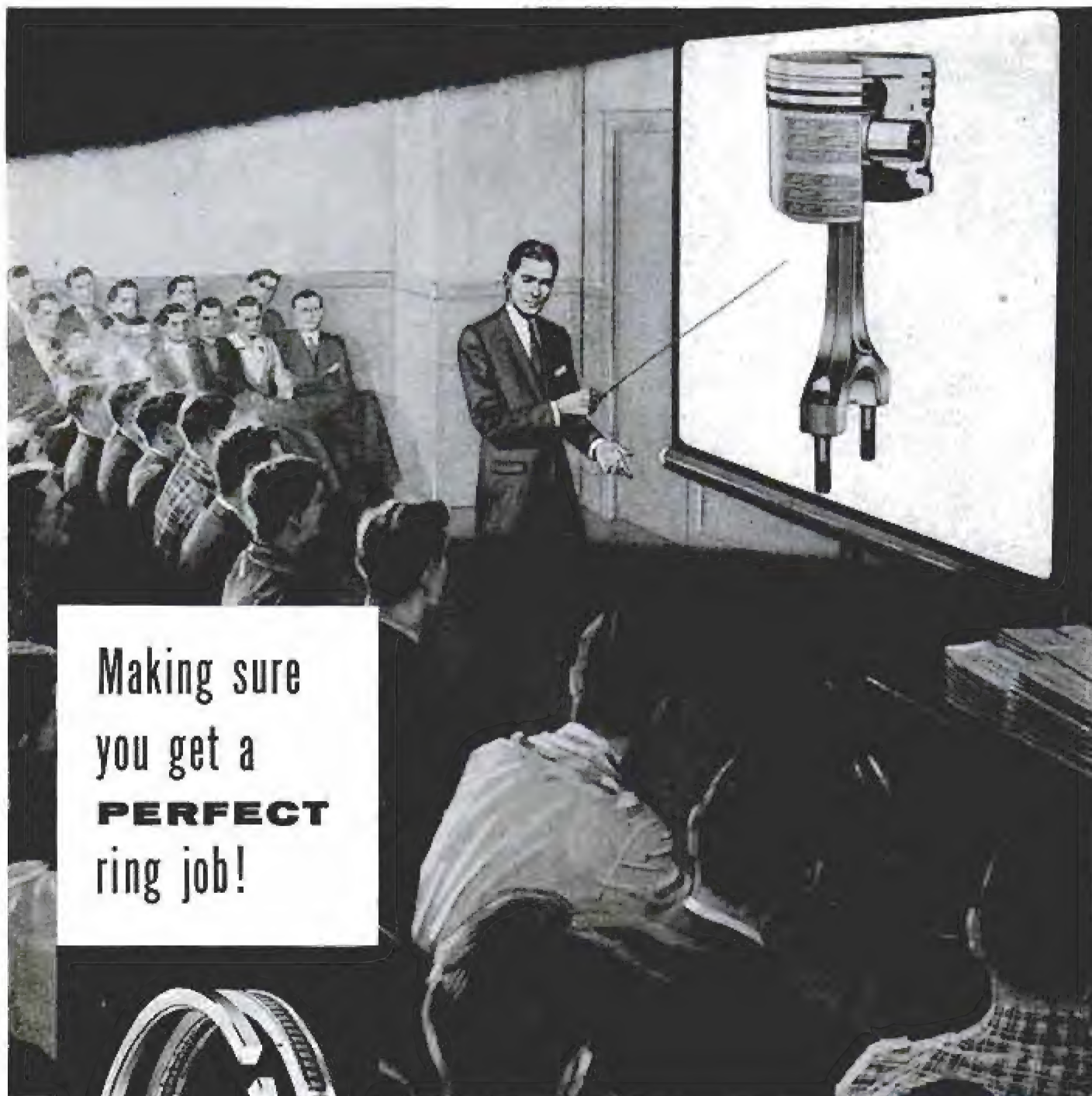


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Tricks That Win on the Speedway

By George Salih

DESIGNER AND OWNER OF THE 1957 INDIANAPOLIS WINNER

as told to

Thomas E. Stimson, Jr.

WHEN FIRST-TIME DRIVERS at Indianapolis are given the final words of advice before they start the 500-mile race one warning they get is:

"Beware of the 'tow' in the first turn of the first lap!"

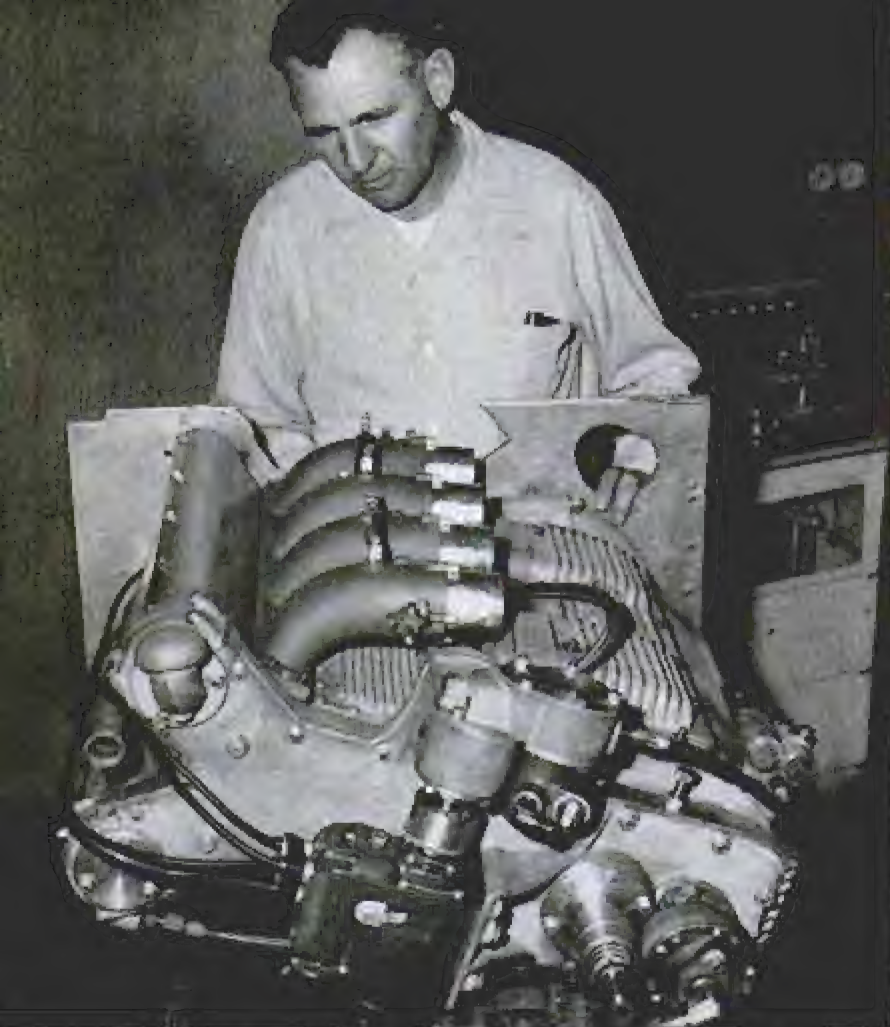
The 33 cars are tightly bunched at the start of the race and they create a wind that pulls newspapers and programs right out of the grandstand. This suction wasn't noticeable a few years ago; today an unwary driver may find that it tows him into the car in front of him. "Lay back until the cars spread out a little," these rookies are told.

A few years ago a driver who was mak-

ing his pre-race qualifying trial would wave his arm as he came down the track to tell the timing officials he was ready to be clocked. These days he barely lifts his hand off the wheel. At 140 or 145 miles per hour he isn't going to stick his arm out in the wind. The timers use field glasses to watch for his signal as he roars past their stand.

Drivers used to find their "speed groove" by gauging their distance from the white line on the inside of the track. Now the groove is wider and farther out. Many drivers watch the retaining wall on the outside of the track as a guide.

Those are some of the effects of the new high speeds in the Memorial Day race.



Louis Meyer inspects a Meyer & Drake engine in its virtually horizontal position, pioneered by the author of this article



Tread is not for traction but to indicate wear. Drivers would like no grooves at all

In the old days a smart driver would make a shrewd guess on the speed that the winner would have to average and he would drive the whole race at that average speed. It was a good system. It reduced the chances of breakdown and was easy on tires and fuel. It won many races.

Then a group of new drivers began to qualify. They had come up from the mid-gets and their philosophy was "Get in front and stay in front!" They raced each other instead of the clock, and they ran away from the conservatives. Sometimes a driver got so far ahead he could make a pit stop and get back into the race without losing his place.

This new kind of driver is one reason speeds have been climbing.

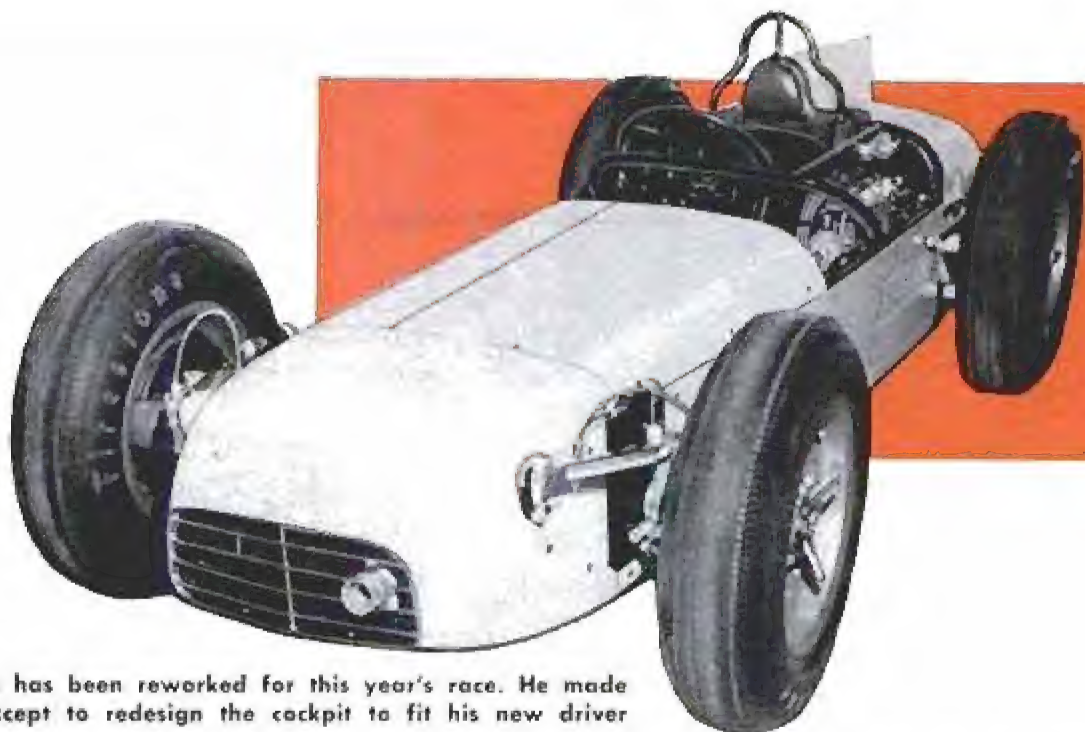
Speeds are going to be higher still in the future, in part because of an idea I've been working on for six years. It has been apparent for a long time that a driver who could go through the turns faster on the Indianapolis track would have an edge on the rest of the field. Trouble is, if you drive through a turn too fast you'll crunch against the outer retaining wall or will spin into the infield. Even at slightly less speed the left-hand wheels are off the ground part of the time in the turns.

Obviously, a car with a very low center

of gravity would be faster and safer in the turns. I began working on a design having a low center of gravity in 1952 but it was years before I could build the car. Meanwhile, pit crews were jacking much of a car's weight onto the left-hand wheels by adjusting the torsion bars. This helped hold the wheels on the ground. Engines and drive shafts were moved to the left of center for the same reason. Some of the engines were laid over at an angle of 36 degrees from the vertical, to lower the center of gravity a bit. This was a help, but some of the tipped engines leaked oil from their crankcase breathers and the oil spilled on the track in front of the rear wheels.

My idea was to lay the stock Indianapolis engine over on its side at an angle of 18 degrees from the horizontal and to modify the engine so no oil would leak from it. Laying the engine completely on its side would be better still but in that case there wouldn't be a reasonably safe clearance under it for the exhaust system. Even at 18 degrees there would be a clearance of only $4\frac{1}{2}$ inches between the exhaust system and the ground.

The center of gravity of most Indianapolis cars is around five inches above the front axle. My "flat" engine would lower the center of gravity to only two inches



Salih's 1957 car has been reworked for this year's race. He made few changes except to redesign the cockpit to fit his new driver

above the axle, an important difference. The drive shaft would lie along the left side of the car, inside the frame, and would be attached to an offset rear end.

While I was working on these ideas I was building conventional race cars for different groups and was running the pit crews for some of the teams. One of the cars won at Indianapolis, another placed second.

Last spring I finally was able to build a car for myself. It was 13 feet 1½ inches long over-all and weighed 1680 pounds dry. I laid the engine over as I had planned and got the lower center of gravity I wanted. With the engine down low, the top of the hood at the center of the engine compartment was only 22 inches above the ground. The top of the fin, behind the driver's head, was 35 inches above the track. Wheel tread was 50 inches, wheelbase 96 inches.

I borrowed \$18,000 to build the car and I couldn't afford to race it. I built it to sell, possibly while it was still under construction. But the prospective buyers decided it was too radical for them. Finally I arranged with Sandy Belond to enter the car at Indianapolis under the name of "Belond Exhaust Special." Sam Hanks drove it and set a new track record in it to win the race.

Hanks drove at an average speed of 135 miles per hour for the 500 miles. This was five miles per hour faster than the previous record, a big jump. This was in spite of the fact that engines were 20 cubic inches smaller than in the past, a requirement that was written into the rules to keep speeds down.

The car baffled Hanks the first time he opened it up in practice.

He said it didn't handle like an ordinary race car. He said he seemed to have complete control of it all the time, on all parts of the track. Sam couldn't find a real speed groove in which the car went best.

Hanks is a good judge of speed. He estimated that he averaged 137.5 miles per hour on his first fast practice lap. We showed him our watches: he had turned 142 miles per hour. The low center of gravity had helped him go through the turns so easily that he had underestimated his speed by a big margin.

There was something else. Sam told me the steering wheel stayed the same size at high speed, that it didn't vibrate in his hands. He said the vibration that jars a driver unmercifully in most race cars didn't exist. We traced this to the flat engine and its support system. With the engine laid over, the usual vertical vibration

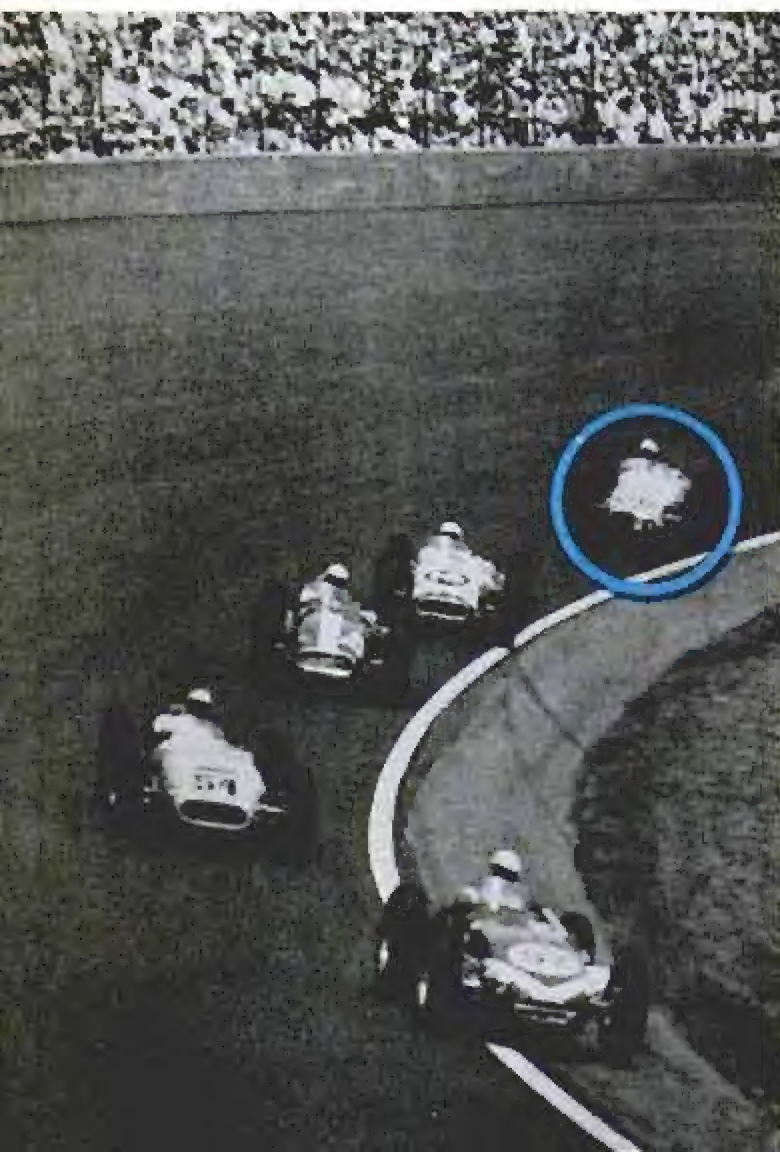
Author Salih fits a guard on car to keep driver's elbow from accidentally hitting rear tire. Note the driveshaft location





They're off! After an extra pace lap due to a minor collision, the 1957 Indianapolis 500-miler gets started

Here are five different ways around an Indianapolis corner. The winning car (in circle) with its lower center of gravity took the corners more easily, with less strain on the driver, reports winner Sam Hanks



becomes a horizontal vibration, and most of this is absorbed in the rubber tires. The result is a smoother flow of power and an easier ride.

That's the way it went in the race itself. The left rear wheel remained on the ground all through the turns and the front left wheel lifted only occasionally. In fact, at the first pit stop we changed all four tires. Hanks was able to race all the way around the track and he passed other cars in the turns, time after time. He didn't have to skid through a turn and then take another car while going down the straightaway.

He made three pit stops for tires and fuel, and on the last stop we were able to change three tires and fill the fuel tank in only 34 seconds. Sam was 39 seconds ahead at the time, so he retained his lead with seconds to spare. He led the field for 151 of the 200 laps in the race. His average speed, minus pit stops and the 31 minutes while the yellow caution flag was out, was better than 141 miles per hour.

A result of this performance is that five cars, possibly seven, are being equipped with flat engines for this year's race. This year the stock Meyer and Drake four-cylinder Indianapolis racing engine was made available in a flat configuration because of the demand. The builders changed the oil sump, modified the breather, installed curved tubes from the injectors to the intake ports, and provided new drain tubes from the camshaft to the oil sump. With these changes the engine runs just as well on its side as in a vertical position and loses no oil.



Indianapolis race track is 2½ miles around, consisting of 1½ miles of straightaways and 1 mile of corners

I'm not saying that my car, or one of the other entries with a flat engine, is bound to win this year's race. After all, second place last year went to Jim Rathmann who was only 17.5 seconds behind Sam at the finish, and Rathmann's car had a conventional vertical engine. The point I'm making is that the low center of gravity allows a driver to go through the turns easier, under better control and with less danger of spinning at high speed.

Hanks has retired as an Indianapolis driver and Jimmy Bryan will drive my car this year. Bryan has been national driving champion three times, took third place at Indianapolis last year, and won at

Monza. I've made very few changes to the car aside from reshaping the cockpit to Bryan's dimensions.

Can a still better car be built? Of course. I'm planning one that will have its center of gravity at the front axle line, two inches lower than in the present car. The engine will have to be laid completely on its side, probably with parts of it redesigned for safe clearance. With such a low center of gravity the car should keep all four wheels on the ground all the way through the turns, at speeds no one wants to try at present. But right now I'm satisfied with the present car. We actually don't know how fast it can go at Indianapolis. ★ ★ ★



Truck-Bed Device Lifts 10 Tons in 30 Seconds

Raising a 10-ton load, without a counterweight to keep the front wheels on the ground, is possible with a new truck-loading device. About 30 seconds is required for the hoist to remove a load from the

ground and lower it into hauling position. Six tapered "fingers" of high-tensile-strength steel, each 42 inches long, slip under the load. The hoist utilizes power from the truck motor through a take-off.



Its Offy engine horizontal, the Quinn Epperly car retains the solid front axle, unlike the Kurtis car below

Will These Tricks Pay Off

SPEED, SPEED and more speed — that's the word at Indianapolis. Veteran race-car builders are again dipping into their bags of tricks to find a winning combination.

Last year, George Salih parlayed driver Sam Hanks and a tipped-over engine into victory. Who will it be this year?

California builder Frank Kurtis puts his hopes on a new trailing-link independent front suspension. The system allows either front wheel to move up and down without affecting the other. Such suspension has long been used on European race cars, but it's new for the Indianapolis 500-miler.

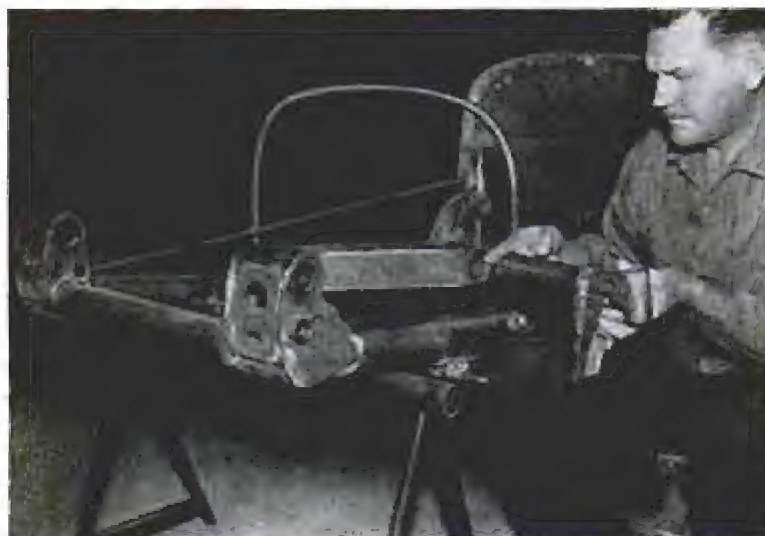
Two free-floating arms mount parallel to the side tubing of the frame. The forward ends of the arms attach to pivots and the

wheel assembly mounts to the rear of each arm. Directly beneath and parallel to each arm is a torsion-bar arm. Shackles just ahead of the wheel assembly join the wheel-carrying arm to the torsion-bar arm. When the wheels bounce, they twist the torsion bars to provide the springing.

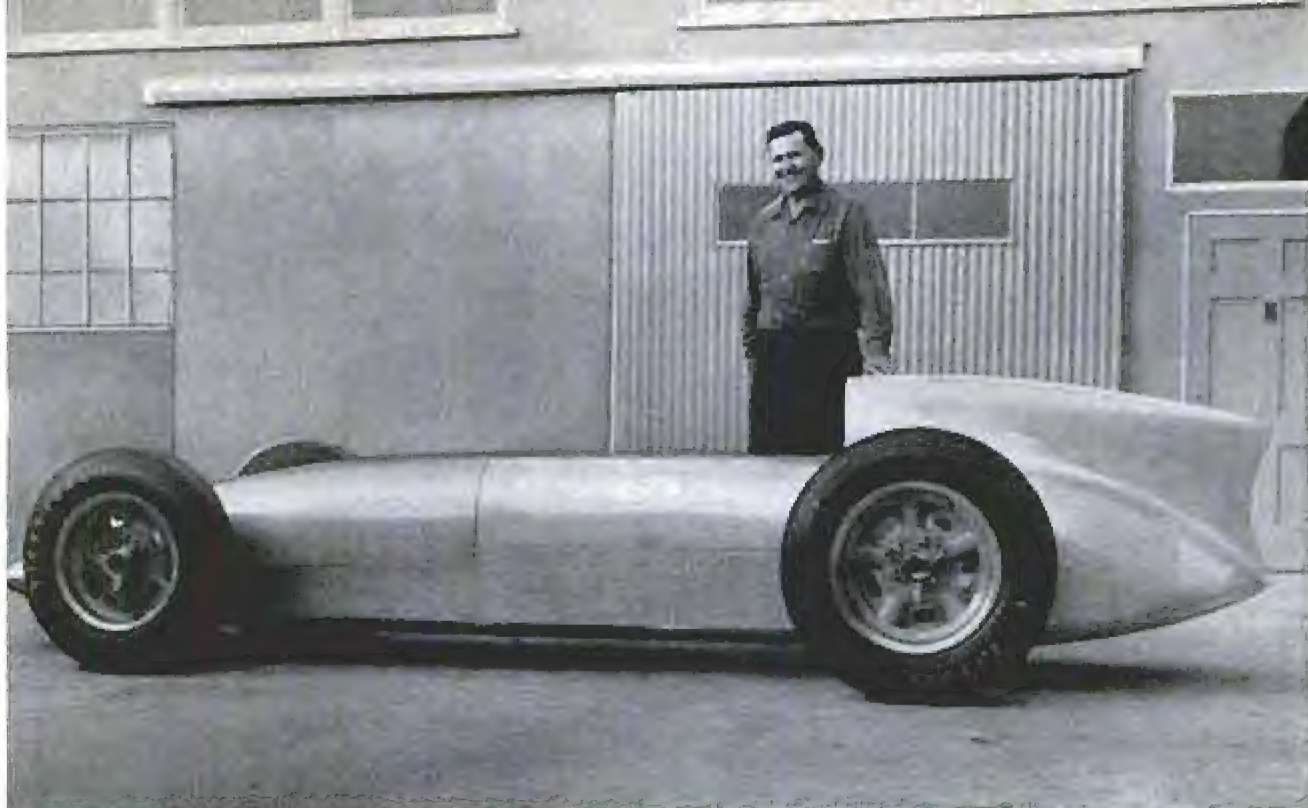
Kurtis feels he'll get better road holding and, therefore, faster speeds through the corners. With a solid axle, the left front wheel tends to lift in midturn so the car gets only a three-wheel bite on the track. With independent suspension, the left wheel remains on the ground, helping the car through the fast turns.

Other builders have different ideas. Two cars being built by Quinn Epperly stick with the solid axle. Epperly built the second-place Hopkins Special last year — a 1600-pound lightweight. He believes in weight reduction as a means to the winner's circle.

In the shops of Eddie Kuzma, there are four cars of relatively standard design. Unlike Kurtis or Epperly, who lay their engines down, Kuzma sticks with the "old fashioned" upright engine. Not all experts are enamored of the horizontal engine, claiming that it



Kurtis shows where the wheel assembly fits in the floating arm. A torsion-bar arm is installed below and parallel to this one



Kurtis poses behind the low-slung D-A Lubricants Special with its trailing-link independent front suspension

at Indianapolis?

By George Moore

creates a tendency to "roller skate" instead of digging in on the turns.

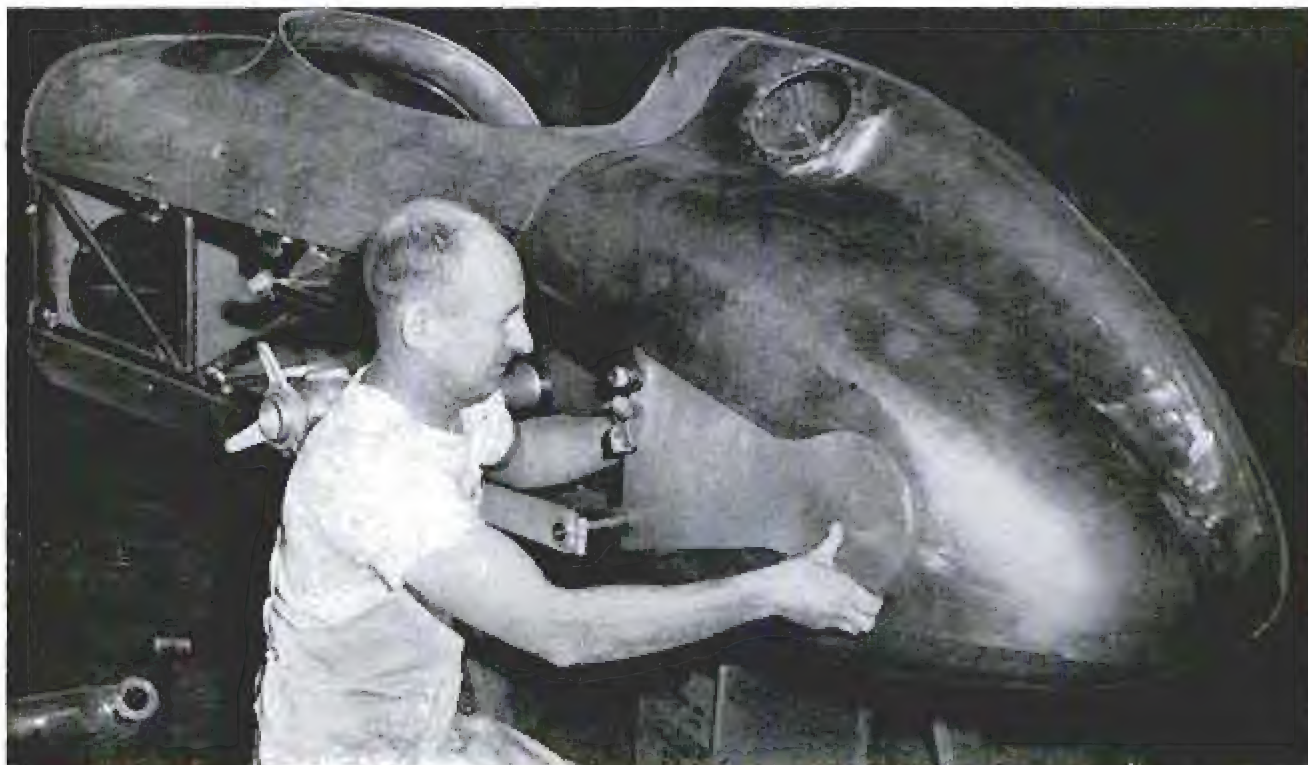
Beneath the hoods of all these cars will be the reliable four-cylinder Meyer-Drake Offenhauser. With its four pistons keeping reciprocating parts to a minimum, the engine brings the cars off the corners and down the chutes far quicker than is possible with an unblown Six or V8.

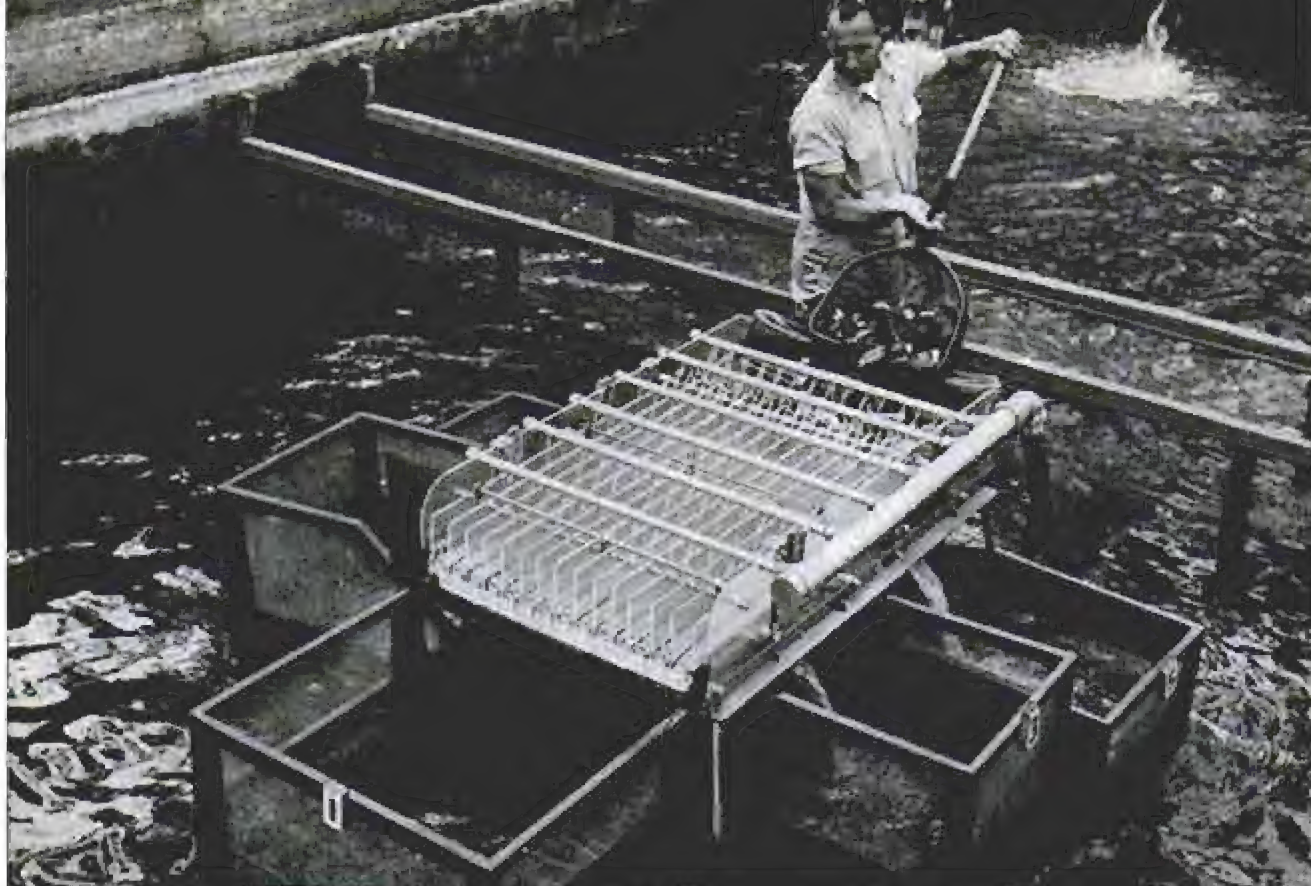
Of course, there will be once again the

opposition of the supercharged Novi V8s. Potentially the fastest cars on the track, these monsters have historically been beset by mechanical ills. Too they are tiring cars to drive as the centrifugal supercharger builds up power surges during acceleration to make control more critical than with an unblown engine.

But they remain a threat. One of these years, that threat may become reality. ★★★

No outer skin covers the gas tank on this Eddie Kuzma car. The tank itself forms the tail to reduce weight



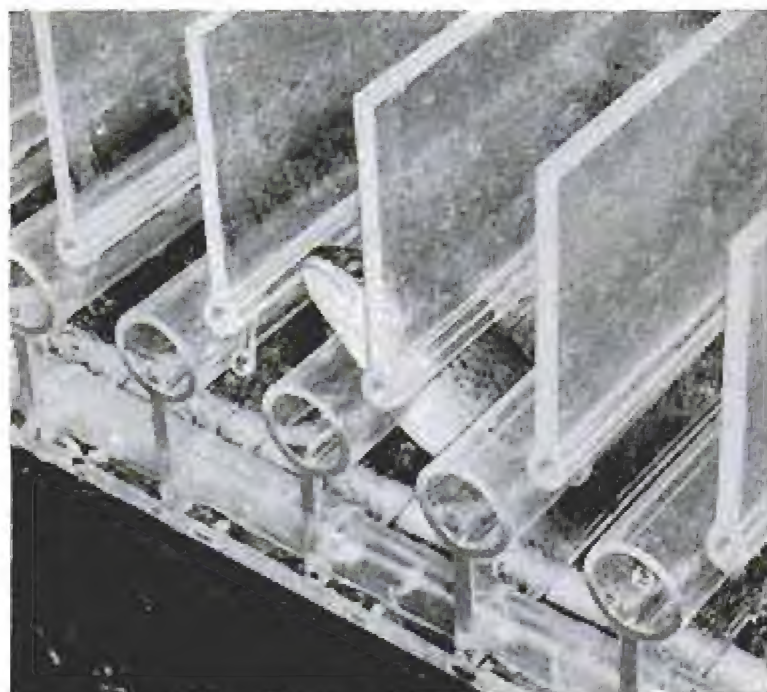


In holding pool, fish are dipped out of "corridor" and grader channels them to one of five live boxes

SORT YOURSELF, LITTLE TROUT!

By Joe Van Wormer

This is how a fish "sorts itself." When it reaches a point where the two tubes are far enough apart, it slips through



THIS YEAR the greatest number of fishermen are crowding our lakes and streams, creating an unprecedented demand for stocking legal-size fish, especially trout, on a put-and-take basis. Since the costs of raising hatchery trout have gone up, an automatic fish grader that brings fish to legal size on a minimum of food, at low cost, answers a hatcheryman's prayer.

This fish grader is the brain child of Gene Morton, superintendent of the Wizard Falls Trout Hatchery, Camp Sherman, Ore. It's the result of many years of experimenting on an idea taken from an apparatus used to grade apples in the Hood River Valley of north-central Oregon. Constructed of aluminum and plastic, the unit is light and mobile and easily moved.

Grading is necessary, for in any given hatching of eggs, some fish



Outlet end of grader being adjusted by means of thumbscrew to measurements of largest fish. Entrance is adjusted to size of smallest specimens

tend to grow faster than others. Soon the larger fish get most of the food, while the smaller ones barely get any. By grading the fish at intervals, and then separating the different sizes, feedings can be adjusted to even up the growth rate. The larger ones are fed less and the smaller ones more. Between hatching and planting, several gradings may be made with the purpose of bringing the entire group to a desired size at a time when planting is scheduled. Holding and feeding oversize fish is a costly process and planting undersize ones is wasteful, so bringing the entire group to the desired weight at the desired time saves many dollars in food costs alone. What's more, it improves fishing.

In grading a pond of fish, movable partitions of wire netting concentrate the fish in a pool. After the grader is set up and adjusted, a representative of the smallest fish is caught and calibrated. The bars near the entryway are then set to this measurement. Next, one of the larger fish is caught and the bars at the exit are set to its measurements. The three grades in between follow automatically. Fish are dipped from the crowding pen and dumped into the grader. Water and gravity quickly take them through and they automatically sort into five sizes.

With this unit, grading requires only a fraction of the time required by former methods, and is less damaging to the fish. As in everything else, automation is becoming a factor even in raising trout. ★ ★ ★



Largest fish in pool run gamut of plastic tubes and fall off into live box. Idea for grader is based on apparatus used to grade apples in Oregon

Five sizes of fish are grouped by each grading operation. All the fish below are the same age, but by separating and controlling feed the smallest can grow to largest size before planting time arrives

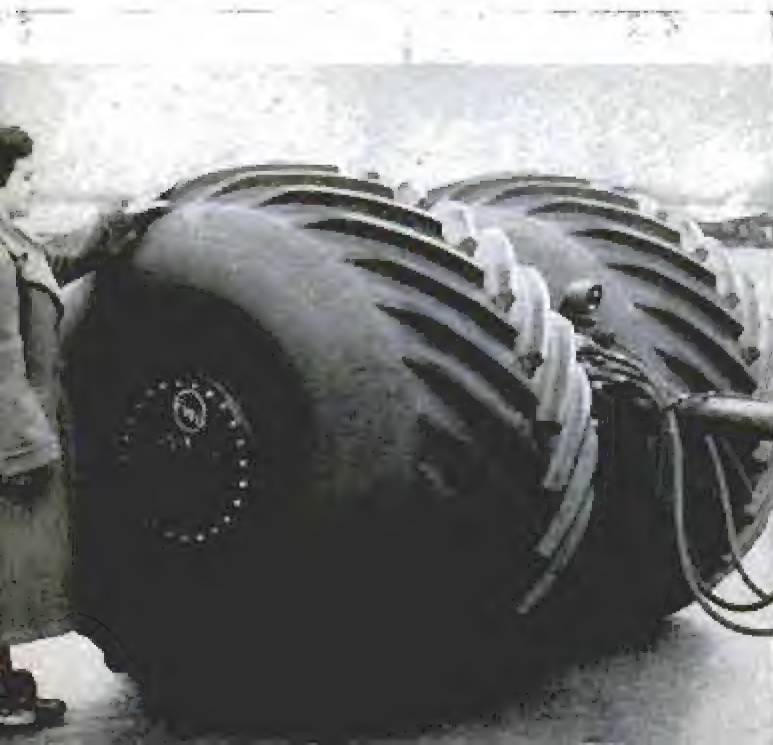




French Aircraft Has Two Decks and Can Transport Automobiles

France's Breguet 763 is the only aircraft with two full-length decks. It accommodates 107 passengers and its lower deck can be quickly converted to carry four tons

of cargo. Because of the spaciousness of the plane's lower deck, and the special ramp, the Breguet can also be used to transport automobiles.



Army Moves Fuel Inside Big Tires

Don't be surprised if you pull into a gas station some day and see the attendant putting fuel, instead of air, into a set of tires. The Army is experimenting with rolling fluid carriers, developed by the Four Wheel Drive Auto Company and the Goodyear Tire and Rubber Company to transport fuel, water or chemicals over swampland and rough terrain. Each of the rubber tire "bags" is five feet high and has a capacity of 500 gallons. They are mounted in pairs on special axles and towing assemblies equipped with filling, emptying and braking systems. An FWD pillow-tire Teracruiser can tow 10 of the fluid carriers, or a total of 5000 gallons of fluid. The tires are corrosion resistant.

Mechanical Cowboy Speeds Ranch Jobs

In the old days of the West, it took a dozen cowboys one day to round up 200 head of cattle, brand and dehorn them. With a "mechanical cowboy" invented by Paul LaRue of Phoenix, Ariz., three men can process 200 cattle in two hours. The device is attached to the end of a cattle chute. A gate drops behind the animal after it enters the apparatus. A yoke clamps its neck, a nose holder grips its head, bars hold its sides.



Expansion Joint Absorbs Road Shifts

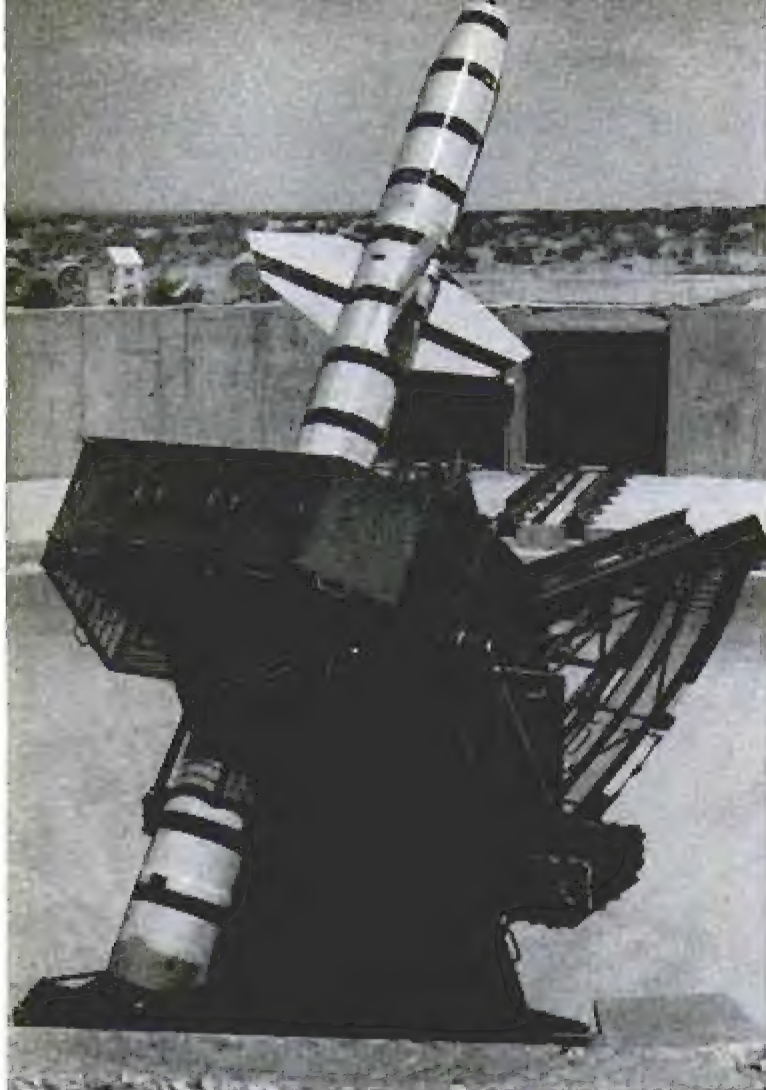
Ever get bounced out of your car seat by a gap in the highway? Development of a unique rubber expansion joint has been designed to eliminate such shocks. The joint, shown about to be inserted, permits as much as three inches of contraction and expansion in a highway or aircraft runway while keeping the rubber flush with the surface. The joint is made of man-produced rubber specially compounded to absorb movement of the highway or runway in cold and warm weather.



Warehouse "Brain" Tends Auto Parts

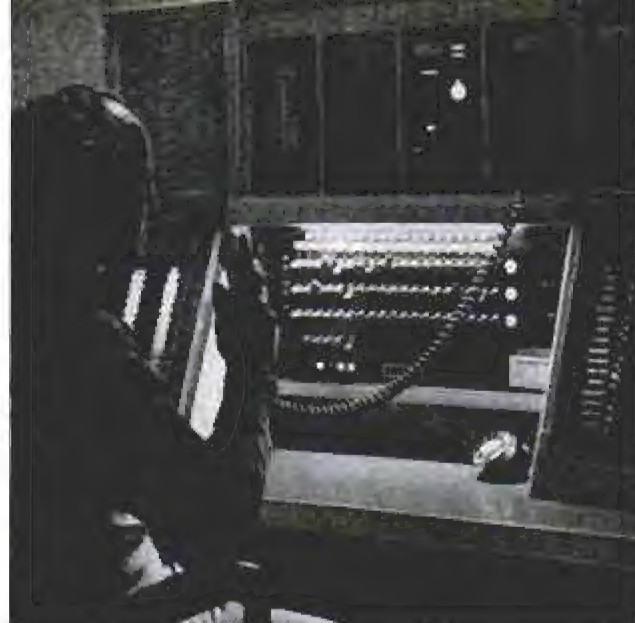
Keeping track of 23,000 items in an automotive supply house was simplified with the addition of a computer and accounting machine. It can store up to five million characters of information, any of which can be retrieved in less than a second. The machine is built around a disk memory unit and keeps the firm informed of transactions and stock levels.





Aluminum Mesh on Trees Stops Gnawing Animals

Bothered by hungry rabbits or other animals gnawing the bark from trees? You can protect the plant by wrapping a strip of aluminum mesh around the trunk. The mesh expands as the tree grows, so bark is not damaged. It's sold in rolls either 4 or 24 inches wide and can be cut with an ordinary scissors. The mesh is wound spirally on the trunk and the top end can be tied with string.



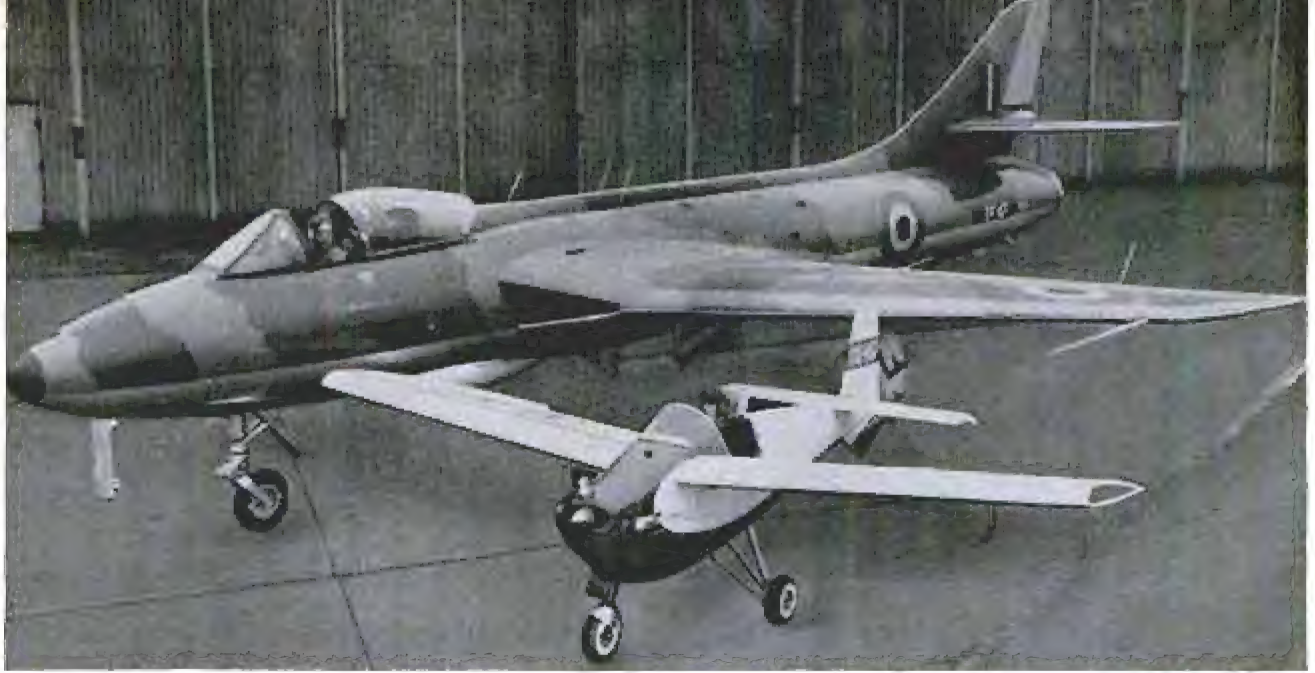
Automatic Defense Base Touches off Missiles

Without the touch of a human hand, the first fully automatic defense base will go into action by itself, launch missiles and guide them to their targets. The base, built by the Radio Corporation of America, launches Talos missiles to intercept planes or attacking missiles. Although the base can be operated with men at the controls, its outstanding feature is its automatic approach to push-button warfare.

Double-Deck Tourist Bus Has Windows Everywhere

Looking somewhat like a greenhouse on wheels, a new sight-seeing bus in Paris allows tourists to see all the sights of the French capital with a minimum of neck twisting. The double-deck vehicle also is equipped with a special public-address system which provides a running commentary on the principal landmarks of Paris. And the commentary is translated into the language of the tourist.





Britain's Midget "Tipsy Nipper" Is Just 14 Feet Long

*see
SEPT 58, 150*

Nestled near the wing of a jet fighter is the tiny, build-it-yourself "Tipsy Nipper" of Britain's Fairey Company. The midget

plane has a wingspread of 19 feet 6 inches. Its cruising speed is 66 miles per hour; maximum range is 187 miles.

Bubble Greenhouse Held Up by Air

Plastic strips sewn together make a portable greenhouse where plants can get an early spring start. Scientists at the Virginia Agricultural Experiment Station are studying its efficiency. An old furnace blower keeps bubble inflated.



Traveling Milker Can Handle 150 to 200 Cows in Single Trip

Cows are milked by milking machines that operate from a specially adapted truck in Buedesheim, West Germany. Piped directly from the cow into a 450-gallon tank,

the milk is then kept at a low temperature by a cooling machine. Some 150 to 200 cows can be milked by the truck during a single trip.



Can We Shoot

SHOOTING UP a missile to destroy an incoming missile is about the same as letting someone take a shot at you, then raising your gun and shooting his bullet out of the air.

An intercontinental ballistic missile with an atomic or hydrogen warhead can be fired from as far as 5000 miles away. It shoots up out of the atmosphere from its launching site, coasts through nearby space in an elliptical orbit, then plunges down toward its target at 15,000 miles per hour.

It gives no advance warning. There is simply a sudden, city-destroying explosion at impact.

How can you defend against such a terrible weapon?

A few years ago most missile experts were convinced there was no defense. Today, however, the United States is preparing to bet billions of dollars that intercontinental missiles can be stopped. Already the first anti-missile missiles are under construction.

One AICBM (anti-intercontinental ballistic missile) is known by the code word "Zeus." Another, called "Plato," is similar but is designed to intercept missiles of shorter range.

In one conception, AICBM base would consist of huge radar surrounded by antimissile missiles

By
Ewart
Thomas



Down Missiles?

Douglas, Convair and Boeing, among others, are engaged in antimissile research.

Engineers who are studying the counter-measures divide their problem into three main parts. First, the oncoming missile must be detected in flight, the sooner the better. Next, its warhead must be identified and tracked so that its trajectory can be learned. Lastly, an interception missile must be sent up to destroy or neutralize the warhead.

Detection calls for some new kind of radar of great range and sensitivity. Both the Army and Air Force have devised radar systems that can detect an ICBM while it is still high above the atmosphere and as far as 2500 or 3000 miles away. This would give an advance warning of as long as 15 minutes before the oncoming missile hits its target. The Army's radar is described as using 20,000,000 watts, a tremendous amount of energy that actually would be lethal to people exposed to the beam even at a distance of a number of miles. For safety, aircraft will be required to remain away from the radar sites.

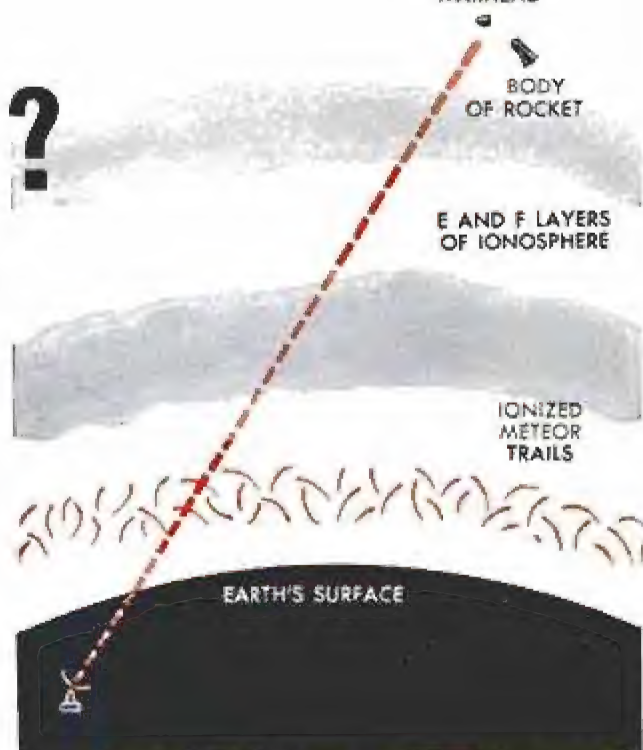
Not only must the detection system be able to spot an ICBM, it must be able to tell the difference between an ICBM and an ordinary meteor. It mustn't be led astray by the ionized trails of meteors or by auroras and other electrical phenomena in the ionosphere. To make sure that they are overlooking no bets, scientists are studying other wavelengths of energy, from infrared to X rays, on the chance they can improve on radar itself.

Identifying the warhead is a separate and difficult problem.

"There may be at least two objects in the sky," an antimissile engineer explains. "One would be the warhead, the other the main body of the rocket. And an enemy might deliberately blow the rocket body into several parts just to create additional objects. Each would move at a slightly different speed and on somewhat different trajectories.

"The problem is to pick out immediately the one object that is dangerous, the warhead itself. This must be tracked for a period of time so that its incoming path can be forecast. On the basis of this information a defense rocket can be aimed and fired.

"At best, no more than a few minutes remain after the warhead is identified and its trajectory is established. In this length of time a defense rocket must be sent on its way and the interception completed."



Radar must penetrate ionized meteor trails and layers of ionosphere and select warhead from body of rocket

It's obvious that defense rockets must be primed and waiting, ready for instant launching. Undoubtedly, solid propellant fuels will be used. It's also obvious that the whole defense must be automatic, with a high-speed electronic computer serving as commanding officer. No human brain could work out the problems, make the correct final adjustments and press the right buttons in the time allowed.

An actual collision between the defense rocket and the oncoming warhead would be ideal, but a virtual impossibility. Other ways of killing the warhead are being

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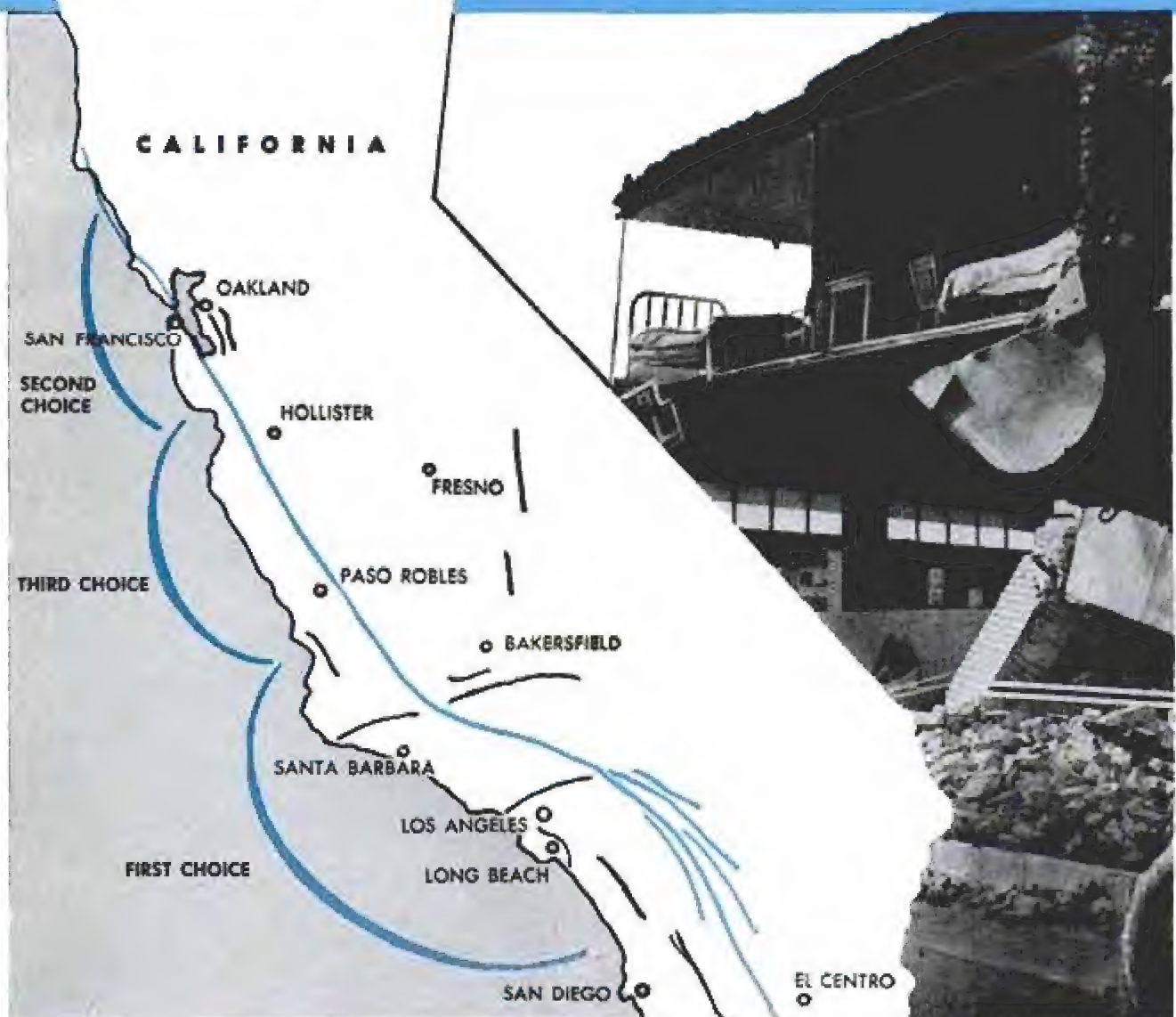
As soon as two points of trajectory are known, computers can determine missile's path and impact point





San Andreas fault is shown in blue, smaller faults in black. Brackets show where future big earthquakes are forecast

STAND BY FOR





Big earthquake in Nevada missed heavily populated areas but dropped land 15 feet and opened fissures

MAJOR EARTHQUAKE!

By Thomas E. Stimson, Jr.

HOUSEHOLDERS, attention! As you know, a major earthquake has occurred. There will be more shocks for some time. It may not be wise to sleep in your house tonight. Try sleeping in the back yard or a park. If you have a barbecue in your back yard, use it. If not, there may be some fallen bricks from your chimney. Build a simple cooking pit with these. Boil water before drinking. If the pipes are broken, get the water from your hot-water heater. If there is no electricity, use your car radio to receive announcements."

This is part of a message that is ready for release by radio stations in California. It was used once, though not broadcast to the public, when "Operation Shakedown" was conducted by the California Disaster Office. This office, a state agency, coordinates relief activities during civil calamities. It is part of the Civil Defense organization. In California, all the resources of civil defense from block wardens up can be mobilized when a major earthquake occurs.

"Operation Shakedown" was a rehearsal for that event. It was assumed that an earthquake had caused death and destruction over a wide area in the state. Radio centers were manned, rescue squads and mortuary teams were set up, and emergency equipment was moved out of storage

and tested. All the activities that would be necessary after a quake were practiced.

To make the drill as authentic as possible, "flash" reports that might be typical in an actual earthquake were forwarded to information centers:

"San Dimas-Big Dalton Dam has burst. Oil-refinery fires spreading in Los Angeles harbor district. Pasadena reports main sewer line broken, sewage flowing down Arroyo Seco. Area G reports seven dead bodies picked up. Glendale has asked for 200 cots for injured or homeless. Long Beach estimates 2300 homes destroyed, many fires."

Seismologists believe that the next great earthquake in California is not far off. They say the catastrophe may occur 10 years from now or it may happen tomorrow. The million-dollar 1957 earthquake in San Francisco was a comparatively tiny affair, they add, and did little to relieve the strain that has been building up.

Small earthquakes are an almost daily occurrence in California; in the southern half of the state alone they average 300 per year. Most of them are local shocks that occur in the mountains or desert areas. They are caused by small adjustments in the network of minor faults that exist in the region. Few of the small quakes are noticed by the public.



The Glendale, Calif., Civil Defense control center holds rehearsals for possible earthquake disaster

What California fears is a major adjustment along the great San Andreas fault that slices diagonally down the state from the vicinity of San Francisco to the Imperial Valley on the Mexican border. The San Andreas is the world's longest active fault and is characterized by rare major quakes rather than by many small ones.

About a fifth of California, the coastal area that is west of the fault, is slowly moving northwest. At the surface this movement amounts to only one or two inches per year; it would be much more except that friction tends to hold the two masses of land together. When the strain finally reaches the breaking point, one side abruptly slips to a new position of equi-

Strain seismograph in tunnel 25 miles from San Andreas fault detects slight pressure on earth's crust



librium. This sudden, violent adjustment produces an earthquake.

Such adjustments occur along sections of the fault, not over its entire length. But even a "local" earthquake on the San Andreas can be great enough to cause damage over a wide area and to be felt from one end of the state to the other.

Last Big Adjustment in 1906

The last great adjustment in the northern part of the fault produced the San Francisco earthquake of 1906. Farther south, the last big adjustment was in 1857, with its epicenter near a corner of Los Angeles county. The earth was ruptured for a distance of 200 miles. The ground was displaced 20 feet or more along the fault. A circular corral on the fault line was changed to the shape of an S. Buildings and large trees were thrown down and the shock was felt as far as 500 miles away.

It is this southern portion of the San Andreas fault, now inactive for a century, that may soon break loose again.

Dr. Charles Richter, Professor of Seismology at the California Institute of Technology, says, "There are several well-recognized possibilities for the location of this expected great earthquake. My own preference is, first, the southern California sector centering somewhere near Fort Tejon; second, the central California sector extending north and south from San Francisco; third, the intermediate sector extending from Hollister to a point northeast of Paso Robles. There are still other possibilities; no part of California is exempt from earthquake risk."

Shockproof Building Codes

Since California can't escape this calamity, what is it doing ahead of time to minimize the deaths and destruction that will occur? It is doing plenty. Aside from the dramatic relief that will be organized at once by Civil Defense, a tremendous amount of unpublicized and extremely important preparation has been going on.

Building codes have been amended to require earthquake-resistant construction. The codes stipulate that concrete or masonry walls must be reinforced with steel bars or mesh. Roofs and floors of buildings must be tied "extra strong" to their exterior walls. Residences must be anchored to their foundations instead of merely being erected on top of them. Walls must be braced laterally, a provision that is good against strong winds as well as quakes. Even one-story fireplace chimneys for homes must be held together with steel rods that extend down into the fireplace foundation.

(Continued to page 242)

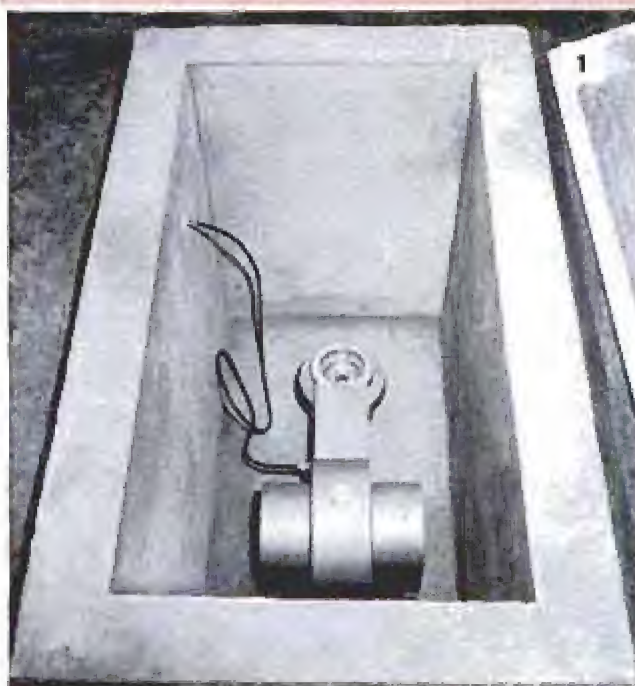


Naval Ordnance Test Station crew prepares depth charges for underwater explosion to study earth's crust

1. Government scientists built seismograph in concrete vault in solid granite on mountain near Tucson, Ariz. Device detects distant earth shocks; granite screens out local vibrations

2. Scientists Frank Werner, left, and Roland White study earthquake signals recorded on drum in Tucson Magnetic Observatory. Signals are received by radio from seismograph on mountain

3. Distance and intensity of earthquake can be computed from wavy lines recorded on drum, but direction of quake must be determined from data received at several seismograph stations





DETROIT LISTENING POST

By Art Railton

IT'S JUST LIKE musical chairs: Somebody has to drop out every time the music stops. And the music will stop occasionally in the next few years.

There won't be enough seats to go around when the Big Two bring out their new small cars in 1960 or so. These new arrivals will push Chevrolet, Ford and Plymouth upstairs into an already-overcrowded middle-price field. When these three giants move up, somebody's going to have to give them a seat. Who will it be?

For 1959, General Motors will drop one of its three basic shells. Detroit is guessing what this will do to the five divisions.

One guess is that the B and C shells will be retained and Chevrolet and Pontiac (now using the A shell) will be all-new, based on the B shell. Seems unlikely. It would mean that the current successful Chevrolet body would be dropped after one year—an unheard-of extravagance.

More likely, it would seem, is that the 1959 Oldsmobile and the two small Buicks (but perhaps the two-shell plan leaves no room for small Buicks) will be built on the current Chevrolet-Pontiac shell. A larger shell would be used for Buick-Cadillac.

Longer, But Longer?

It doesn't seem likely that the Chevrolet will be lengthened for 1959, although that's the rumor (some say as much as nine inches longer). If anything would break the camel's back (the camel's back, in this case, being public faith in the auto industry), it would be for Chevrolet to come out with a longer car. The long-car symbol seems to be weakening fast and there's no replacement in sight at the moment.

By eliminating one of its three shells, GM will save money—money it will use to build a small car to drive those nervy, noisy imports into the sea!

Ford will be in there fighting for its share of the fast-growing small-car market. (Imported-car sales are running 100 percent above last year right now.)

Meanwhile Ford, like GM, covers its bet with the British Ford (this year it will sell 35,000 here). In September it begins importing German-made Ford Taunus sedans and wagons. Looks like a big year for the designed-in-Detroit, built-in-Europe cars.

Chrysler had better latch onto an import pretty soon to meet this competition.

Incidentally, interest in the upcoming small cars is so great that outsiders are offering as much as \$1000 under the table for advance sketches of the designs!

What's Chevy's Secret?

Why does Chevrolet sell so well while most others sag? Not even Chevy's top man, Ed Cole, knows the answer. Sure, it's a good car, but it's not that good. It is selling at its 1957 rate while Ford and Plymouth are down sharply.

One theory is that the public has become completely fickle and owner loyalty is weakening as the important factor in sales. There may be just so many new cars to be sold and the newest, freshest style gets the business. The others starve. Like the Miami Beach hotels, each year the newest and fanciest one is jammed while the others simply pick up the overflow (if there is any).

Such a marketing condition could throw the industry into panic. It must have sales stability. You can't have billion-dollar facilities sitting idle for two years while you await your turn to be the fad.

Meanwhile the public goes along worrying not at all. Johnny Q. feels that the industry built itself into this corner. It built up the concept of styling "ober alles."

But the reign of the stylist may be over. George Romney of American Motors thinks so. Stylists are still top dogs, he says, but their importance is declining. If so, say some engineers, it couldn't happen to a more deserving bunch of guys.

Cars are too long to be practical, Romney claims, but they are not too low. Americans demand stylish lines and you can't raise the roof without hurting style, he says.

Yet most dimensional complaints received here are about cars being too low to get into or too low to wear a hat in. Adding two usable inches to the height of a car would seem as sensible as cutting two non-usable feet off its length.

General Motors is going back to the Big Sell. It plans to put on a Motorama in New York this winter. No road show, though. Only Boston will get it after New York. Even Miami Beach is out, an omission that upsets GM executives' wives just a bit.

If the Motorama won't sell cars, the only hope is the war babies. By 1961, they will be marrying and a new boom will begin!



Martin Chernault, above, discovered this natural ice cave 24 years ago while digging for water on his farm on the Lillooet Plateau of central British Columbia. He uses the cave for storing his perishable food

Within the base of the unnamed mountain towering 2000 feet above Chernault's cabin is the ice cave

ICE CAVE

The burlap over the entrance of the cave keeps out dust and rocks that tumble from the mountainside. Ice forms only on walls and floor of the cave, temperature at ceiling remains a constant 36 degrees



OWNERS
REPORT

A NATIONWIDE SURVEY

Bigger Pontiac Still Easy
To Handle, Say Owners

Owners like Pontiac's handling ease, power and performance, and exterior styling most, in that order. They praise its new sculptured sides and the rear-end styling with its four high-mounted taillights.

The owners complain about gasoline mileage, body noises and poor factory workmanship, in that order. The two most-disliked exterior features are those sculptured sides and an impractical gas-tank filler pipe.

MARGINAL NOTES BY
ART RAILTON, PM's
AUTOMOTIVE EDITOR

Power steering easy enough, but too much wheel movement required, a fault not exclusive with Pontiac.

Power aplenty. Kelly's test shows 0 to 40 in 5.25 seconds. It really goes! On fast drags, rear end has tendency to fishtail, even on dry pavement.

Apparently a reference to Chrysler tailfins. GM owners seem supersensitive about fins, whether in envy or disgust is impossible to tell.

A fine high-speed car. Extremely quiet. At 60, you feel isolated and secure, almost dangerously so, as you float along effortlessly, perhaps even carelessly.

PONTIAC MAY be bigger than ever (its all-new body is 2.2 inches wider than in 1957 and some models are as much as 8.7 inches longer), but nevertheless owners praise its ease of handling.

Top-rated item is handling ease with 49.2 percent mentioning it. Next come performance and acceleration with 39.8 percent of the owners mentioning them. Most frequently mentioned complaint: Poor gasoline mileage with 14.6 percent of the owners in the survey listing it. Although this figure tops the list of complaints, it is lower than you might expect in view of this year's increased economy interest.

Here are some of the owners' statements about their new Pontiacs, arranged in order of frequency of mention:

"I like steering ease. Much improved. Doesn't need power steering."—New York bakery worker.

"Best handling car I ever owned."—Montana repairman.

"It is alive. Plenty of pep."—Massachusetts engineering vice-president.

"I really think Pontiac has a good racing car. I run mine every Sunday at a drag strip. I have won three trophies and will win a lot more because nothing in the same class has ever beat me yet."—California manufacturer.

"Just touch the gas pedal and she is gone."—California Air Force man.

"Tasteful design and colors. Not too much chrome as in some other models."—California bus driver.

"Never had a car that got so many compliments. Not overdone with frills and chrome. No fads to outdate the car in a couple of years."—Missouri engineer.

"Rides very smooth. A pleasure to drive over country roads."—New Mexico rancher.

"Comfortable to ride in."—Iowa sheriff.

"I like its roadability around curves, on straight roads at high speed. When caught in a strong wind it holds the road extremely well."—Illinois owner.

"Steady at high speed."—Colorado secretary.



From inside and out, the Pontiac looks big. Owners rate this big, low look the best-liked styling feature

Here Are Complaints

Almost a third of the Pontiac owners in the survey have no complaints at all (32.5 percent). But the rest do complain. Here are their complaints in order of frequency of mention:

"I am unhappy with gas consumption. I find it difficult to keep track of mileage but do know that my gas bills are one third more than they were last year."—California physicist.

"Uses too much gas. Average 12 miles per gallon in the city, 14 on long trips."—Florida salesman.

"Too many rattles. Car feels as if it needed a good tightening up every 500 miles."—New Jersey foreman.

"A rattle box."—New York owner.

"Factory workmanship very poor. Trunk and window leaks. Radio bad. Heater leaking. Headliner loose. Upholstery torn. Vent didn't work. Rattles. Nice car, but not worth the price."—Maryland engineer.

"Basic car seems sound, but the accessories are all stuck on so poorly that I have had to have it almost overhauled. Radio out, speakers stutter, windshield washers don't work, clock doesn't run, turn signals out. All were fixed with no charge, but rather annoying for \$4500."—Indiana printer.

"In three months it was in for repair over 18 times. I am still having trouble. According to the dealer, the car now has had a new rear end, carburetor, muffler and a Hydra-Matic leak has been repaired, yet it still does not give good performance."—Massachusetts accountant.

"Shavings were left in automatic transmission and caused trouble at 380 miles. Company only repaired it, did not replace it. Still not satisfactory. Park position sometimes fails and the car slowly creeps in Park with engine off."—Michigan inspector.

"Automatic transmission shifts rough."—Utah owner.

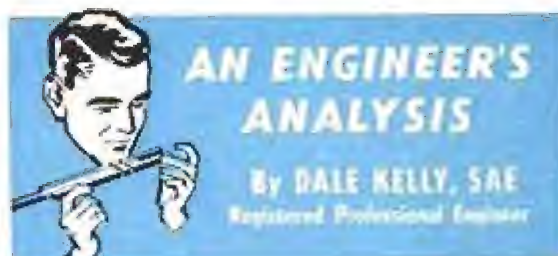
"Leaks like a sieve. Water stands level with doorsill and freezes at night, leaving ice in rear of car."—Maryland builder.

Although no miser, not bad as cars go today. Kelly's test car with two-barrel carb did better than two high-performance low-price cars tested in January PM. But let's face facts: Today's heavy, automatic cars use gas, lots of it.

Test car (a four-door hard-top) had only one body noise: a squeak in right front window. Window wind-up very stiff. It took considerable effort to raise or lower them.

Test car had troubles, too. One turn-signal light fell out of bumper during test, electric antenna switch didn't work, wiper switch unreliable, shift quadrant misaligned.

Except for a brief period when cold, shift of test car was smooth, almost imperceptible.



AN ENGINEER'S ANALYSIS

By DALE KELLY, SAE
Registered Professional Engineer

1958 PONTIAC TEST DATA

MODEL TESTED: 1958 Pontiac Super Chief four-door hardtop with two-barrel carburetor, dual exhausts, Hydra-Matic transmission, power brakes and steering.

Rear-axle ratio: 3.23 to 1. Wheelbase: 124 inches. Tires: 8:00 by 14. Weight: 4238 pounds with gas tank half full (55 percent on the front wheels, 45 percent on the rear).

Mileage on car at time of test: 650 miles. Barometer: 29.03 inches. Temperature: 68 degrees F. Payload: 200 pounds.

ACCELERATION TIME FROM STANDING START (in seconds)



Ignition timed for:	0 to 20	0 to 40	0 to 60	0 to 80	1/4 mile
Regular gasoline.....	2.2	5.7	10.8	18.0	18.1
Premium gasoline.....	2.2	5.25	10.1	17.2	17.7
Super-premium gasoline.....	No improvement noted				

(All tests in Drive range. Gasoline had the following octane ratings by Research method: Regular 90; Premium 97, Super-premium 105.)

FUEL ECONOMY (miles per gallon)



Ignition timed for:	Steady 30 m.p.h.	Steady 50 m.p.h.	Steady 70 m.p.h.	Traffic Route
Regular gasoline.....	17.6	16.3	13.2	8.9
Premium gasoline.....	17.3	16.7	13.9	9.0

(In traffic test car makes 10 full stops per mile and is driven fast enough to average 15 miles per hour.)

Estimated average

ANNUAL GASOLINE BILL: \$224 for 10,000 miles

(Based on assumption that 75 percent of owners will prefer to use premium gasoline at 33 cents a gallon.)

SPEEDOMETER ERROR (miles per hour)



Speedometer reading	20	30	40	50	60	70	80
True speed	18	27	36	46	54	64	73

ODOMETER ERROR (miles traveled)

Odometer registered 103 miles for an actual distance of 100 miles



DRIVER'S VISION

Driver could see some portion of the road **21 feet** ahead of the front bumper and could see the full width of the road **23.5 feet** ahead.



GROUND CLEARANCE (unloaded car)

Worst dip that could be crossed.....31-ft. radius
Worst hump that could be crossed.....20-ft. radius
Deepest rut that could be negotiated.....6.5 in.
Curb clearance for door opening.....13 in.

MISCELLANEOUS

STEERING

Steering-wheel turns for 100-ft. circle...0.85 turns
Curb-to-curb turn-circle diameter.....43 feet
Wall-to-wall turn-circle diameter.....46 feet
Steering-wheel turns, lock-to-lock.....4.3 turns

CENTER OF GRAVITY: 22.2 inches high

TRUNK CAPACITY

15 cartons (one cubic foot each)

WATER RESISTANCE

Excellent. In the splash-pan test and the high-pressure car wash there was no appreciable water leakage and no effect on the brakes or ignition.

OBSERVATIONS

The excellent performance obtained with the two-barrel carburetor leads one to wonder why so many motorists seem to prefer the complicated and expensive four and six-barrel setups. Over-all gas economy was better than that of two of the three so-called small cars tested in January (Ford, Chevrolet and Plymouth).

Hydra-Matic has a fluid coupling instead of a torque converter. Torque multiplication is by a four-speed gearbox. A downshift for extra acceleration could be obtained at any speed up to about 60 miles per hour. The two Drive ranges are not distinguished or identified on the selector quadrant. You experiment to find out which uses three speeds, which uses four.

Instrument panel has five needle-type instruments.

None has been supplanted by a warning light. You can tell (roughly) how much oil pressure you have and you can be sure your battery is being charged. You can do neither of these with a warning-light system. Unfortunately, no instrument except the speedometer has any numbers on its dial.

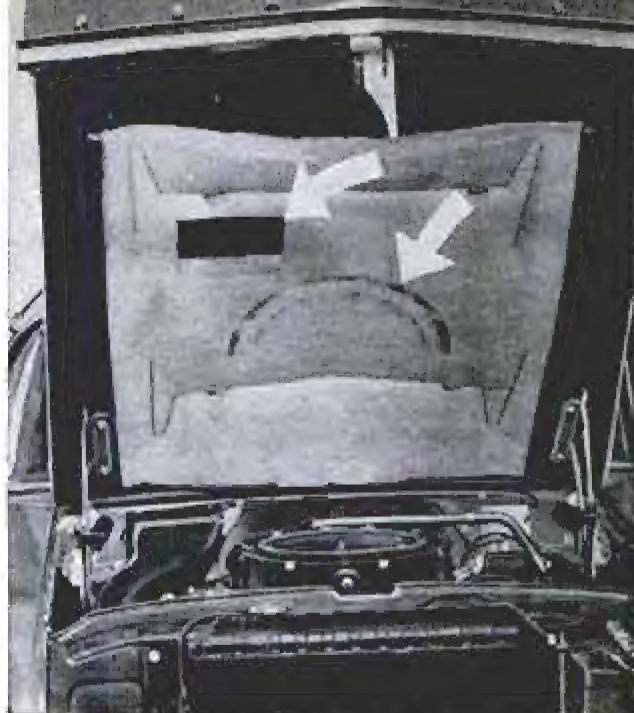
When the gasoline tank was allowed to run dry and then refilled, it took almost four gallons to move the needle on the gasoline gauge.

Power-brake vacuum reserve was enough for two applications with a dead engine. After this it took a heavy pressure to stop the car.

Rear overhang is too low for its length. It will give trouble on sloping driveways and ramps.



If you run out of gas, you need a long hose to pour into tank. Flexible spout on can is not long enough



So close is space under hood figured, insulation is cut out to clear pulley. Air cleaner touches blanket

Advice to Industry

Those are the most frequently mentioned likes and dislikes of owners from coast to coast, the people who know the car best.

We also asked these owners to make one suggestion to the industry as a whole. Here are some of the most interesting comments:

"Car manufacturers have reached a point of no return. My 1953 Mercury would cruise faster than anyone should drive and averaged over 18 miles per gallon on trips. My 1955 Oldsmobile averaged about 17 miles per gallon on the highway. Today, even the so-called small American cars average less than 15 miles per gallon and the engines require more work to run correctly. There should be a tax on horsepower and car length over a certain amount. This will tax those who can afford the longer and more powerful cars."—Missouri publisher.

"Don't change styling each year."—New York owner.

"Put more room in the car, less in the trunk."—Ohio dock worker.

"Build a car a man has some room in. They are built too low."—Minnesota investment manager.

"Build so we can use regular gas instead of high test."—Connecticut tool engineer.

"Cars are built too low for a farmer. It's hard to drive out in the fields or on dirt roads."—Iowa farmer.

"Slow down assembly line so dealer won't have to correct all factory faults."—Kentucky grocer.

"Take the bugs out before the customer gets the car. Dealers get the brunt of public feeling and do not deserve it. Neither does the public deserve inferior cars. I used to say 'Buy a second-hand car and you buy somebody's headache.' Now I buy a new car and buy my own headache."—Maryland personnel officer.

More Best-Liked Features

The following quotations by Pontiac owners describe additional oft-mentioned best-liked features:

"Brakes are good."—Maine executive.

"Smooth power with automatic transmission."—Illinois farmer.

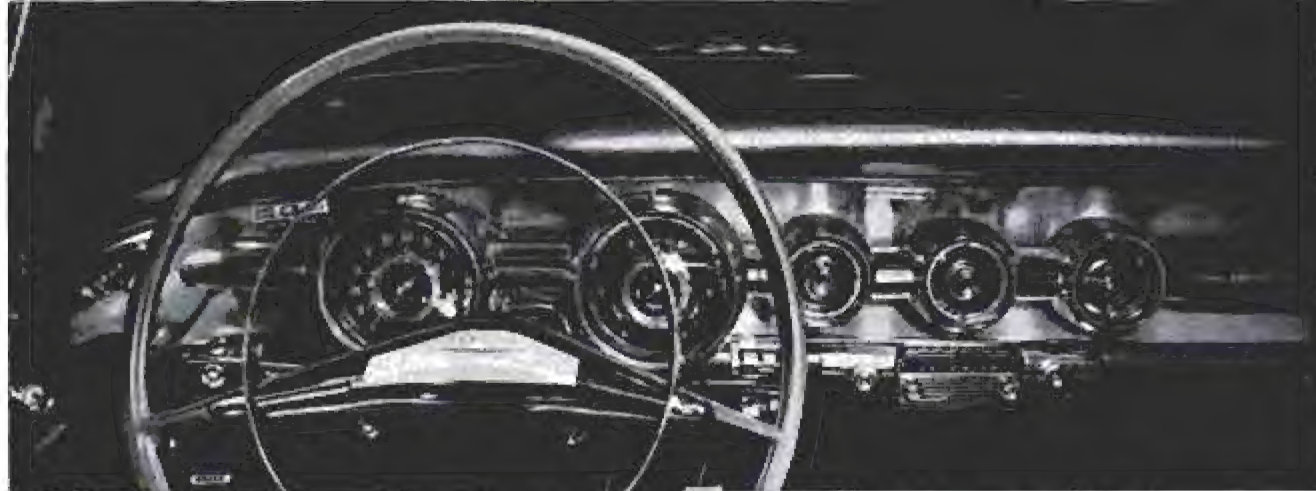
"I am a salesman and drive 20,000 miles a year. I trade

These comments are not from we-hate-Detroit cranks, but from folks who are sold on Detroit's cars, in fact, they just bought one.

What about this idea?

Detroit would go broke making cars to please farmers who drive through fields!

Brakes pulled slightly to the right on test car.



Pontiac provides full gauges for all instruments, no warning lights used. But shiny chrome is everywhere

Most Pontiac owners in the survey claim to get between 14 and 18 miles per gallon on long trips. On a 150-mile trip, the test Pontiac averaged 14.6 miles per gallon. It's not long-trip mileage that owners complain about, it's traffic mileage.

Rear-seat headroom in the four-door hardtop very good, especially by today's standards.

But the Pontiac "senses" big—very big. Driver feels he is in an extremely wide car, as indeed he is. This width provides a mental block against "scooting" in traffic or ducking into small spaces. After a period of adjustment this feeling probably vanishes.

every year. I get 14 miles per gallon in the city and 19 miles on trips. Operating cost is low."—North Carolina insurance agent.

"I consider gas mileage excellent for its tremendous power. I get 17 miles per gallon on trips."—California school teacher.

"Magnificent dash panels."—California jet pilot.

"New instrument panel. Glove compartment is not under radio as in 1957. Heater controls big improvement."—Delaware government inspector.

"Body tight and seems dustproof."—Arizona owner.

"Strong frame."—Minnesota advertising man.

"Sufficient headroom for tall person. Plenty of legroom."—Ohio Linotype operator.

"Pontiac has always had a good motor."—Maryland crossing attendant.

"I like being able to see where the ends of the fenders are. Helps in parking and in judging distance when meeting cars on narrow streets."—Missouri saleslady.

"Large trunk."—Indiana farmer.

"New suspension. Lack of road noise, improvement in road shock. Ease of tracking."—Missouri miner.

"Sturdy front suspension. Takes rough treatment."—Texas owner.

(Continued to page 238)

HERE'S A SUMMARY OF PONTIAC OWNERS' OPINIONS:

OVER-ALL RATING: **Excellent 68.3%** **Average 29.3%** **Poor 2.4%**

Best-liked features

Handling ease	49.2%
Power, performance	44.3%
Exterior styling	39.8%
Riding comfort	37.0%
Roadability	13.4%
Power brakes	6.1%
Auto. transmission	5.7%

Most-frequent complaints

None at all	32.5%
Poor gas mileage	14.6%
Body noises	13.8%
Poor workmanship	10.6%
Auto.-trans. trouble	5.7%
Water leaks	4.5%
Poor paint job	4.1%

Had engine trouble?

No trouble	84.4%
Some trouble	13.5%
Considerable trouble	2.1%

What was trouble?

Carburetor, choke	7.8%
Oil leaks	1.2%
All others	6.6%

Best-liked styling feature?

Bigness, lowness	19.5%
Chrome side trim	9.4%
Front grille	7.7%
Rear end	5.3%
Dual headlights	4.5%

Least-liked styling feature?

Fender sculpturing	4.9%
Gas-tank filler	2.4%
Extreme lowness	2.4%
Bumpers	2.0%
Rear overhang	1.6%

Best-liked interior feature?

Dash, instrument panel	25.2%
Upholstery	11.0%
Seat design	8.9%
Colors	6.5%
Carpeting	3.3%

Least-liked interior feature?

Glove compartment	10.6%
Stepdown floor rear	3.3%
Center armrest rear	3.3%
Dash, instrument panel	2.8%
Transmission hump	2.8%

How is dealer service?

Excellent	62.2%
Average	30.9%
Poor	6.9%

Would buy from him again?

Yes, would	56.6%
No answer, undecided	34.9%
No, would not	8.5%

What make was traded?

Pontiac	61.0%
Another GM make	19.1%
Ford Motor Co. make	7.3%
Chrysler Corp. make	5.7%
All others	1.2%
No trade, no answer	5.7%

What make will buy next time?

Another Pontiac	68.3%
Another GM make	4.9%
Chrysler Corp. make	2.0%
Ford Motor Co. make	1.2%
All others	0.8%
Don't know, no answer	22.8%

Approve industry style trends?

Yes, approve	80.1%
No, do not approve	13.3%
No answer	6.6%



Big helicopter for executives is a refined commercial version of an existing military transport helicopter

Executive Helicopter Has Plush Interior

FOR YEARS, the executive plane has been a part of American business. Now it has a new companion in the skies—the executive helicopter. Vertol Aircraft is now producing a commercial version of its military transport helicopter. Priced at \$300,000, it accommodates 10 passengers, has moving swivel seats, a sofa, a galley, a loud-speaker system, wall-to-wall carpeting and even a lavatory with running water—believed to be the first copter so equipped.



Plush interior includes a sofa, conference table and telephone

Swivel chairs can be moved into position for a conference. Helicopter also has a kitchen and a lavatory





Darkroom Enlarger Aid Permits Tone Control

Now you can "paint" with light to get special tonal effects while making photographic enlargements. A new darkroom tool allows you to direct a beam of light onto the enlargement as an artist uses an airbrush. The technique fogs the print with raw light, but with precise control. The device can be used to absorb shadows, soften highlights, enrich the blacks or improve the brightness range of the photograph.

Pancake-Shaped Disk of Fire Aids Studies of Jet Engines

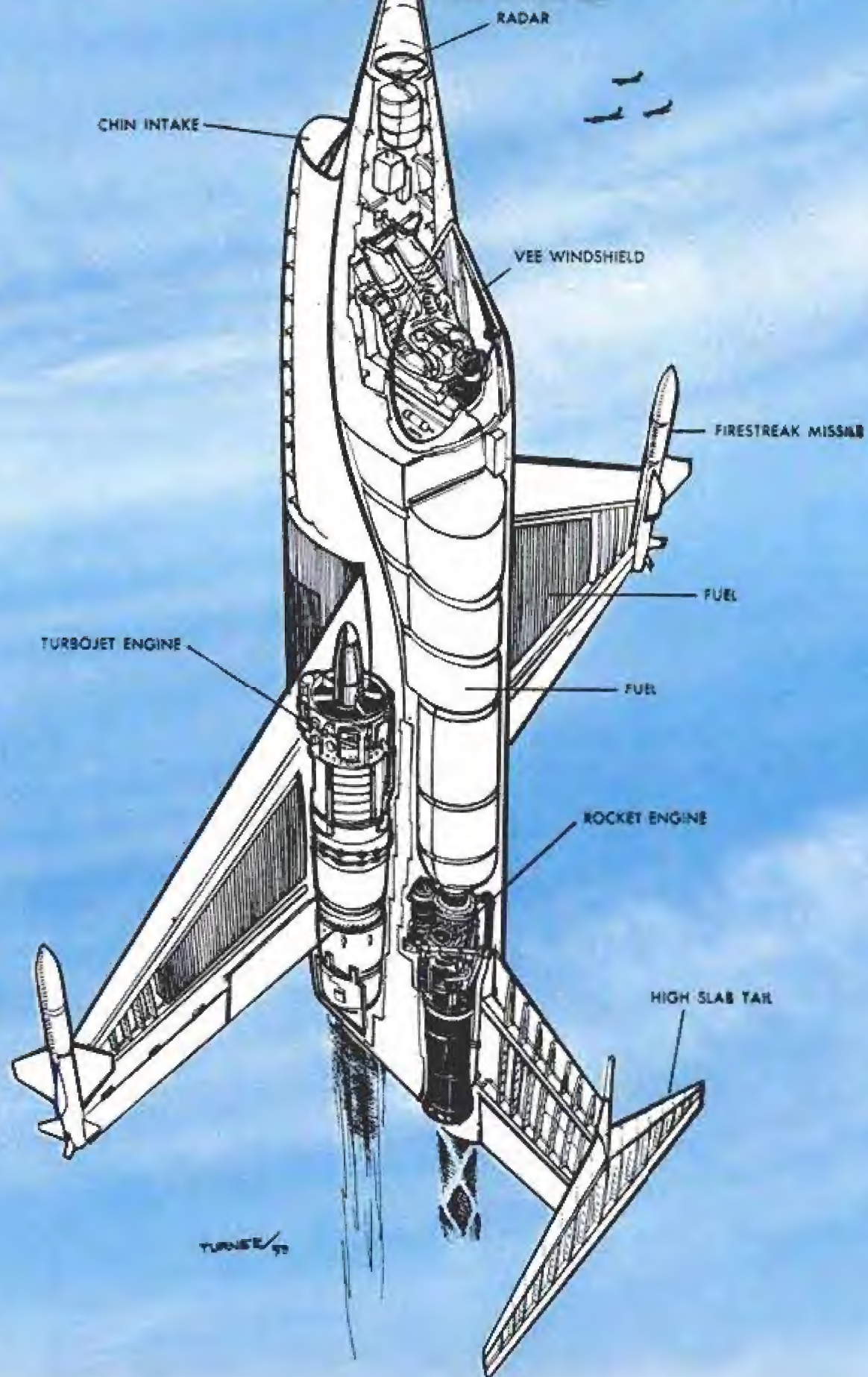
Scientists at John Hopkins University have discovered how to produce a pancake-shaped disk of fire which floats in mid-air. The flat flame has practical use in aircraft and missile research because it aids the scientists in studies of jet-engine and rocket combustion at high altitudes and low temperatures. The flame can be raised or lowered by adjusting a copper plate.

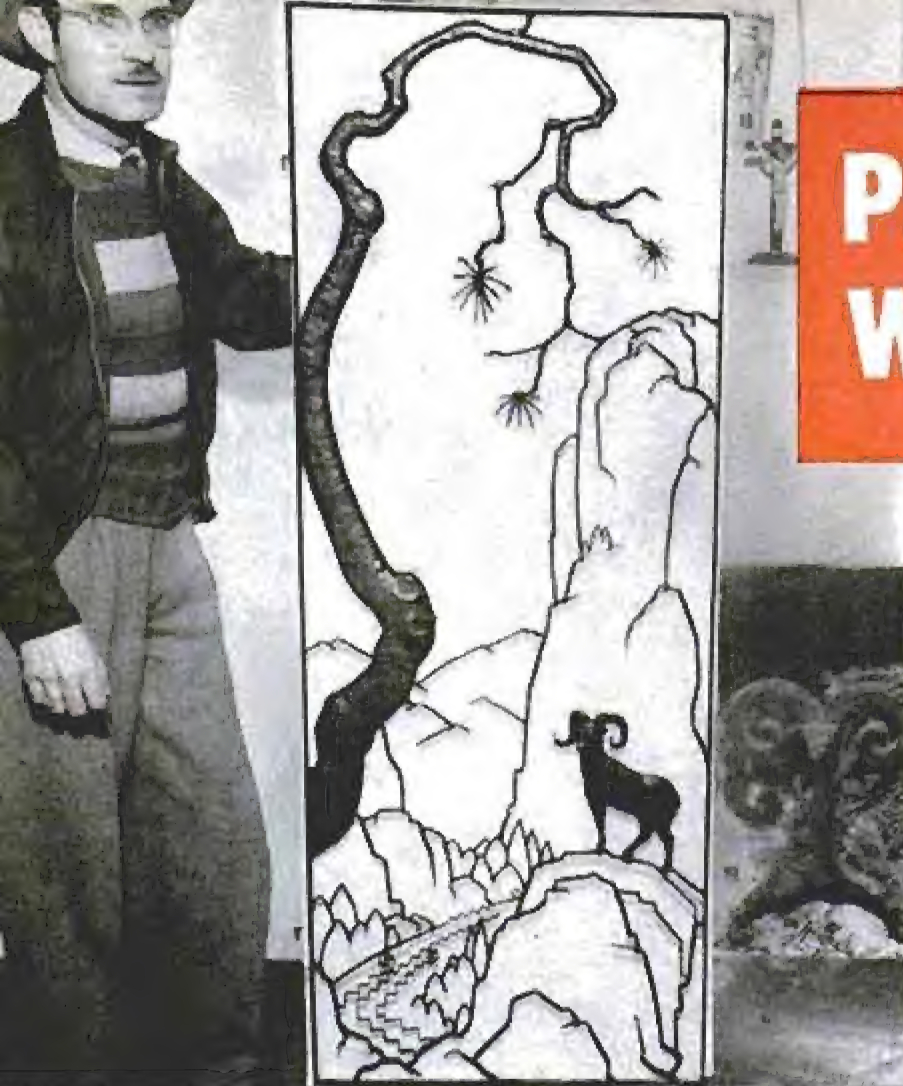


Britain Builds a

ANSWERING THE THREAT of supersonic bombers, the British have introduced a man-piloted rocket-turbojet plane, capable of flying at heights and speeds far greater than the more conventional interceptors, such as the U.S. Air Force's 104 Starfighter. The rakish new plane, known as the SR 177, is under construction by two British companies—Saunders Roe and de Havilland. Major advantage of the SR 177 is that it will perform feats that even the best turbojet interceptor could never hope to achieve. It will, in fact, have the performance of a missile. Since a rocket engine does not require oxygen from surrounding air, the 177 can operate at great power in the high-altitude "thin air" regions. At 20 miles up, the plane will travel at very high velocities without trouble from the so-called thermal thickets. It will be rammed through space by the tremendous thrust of the rocket motor housed inside the fuselage under the tail assembly. The turbojet engine, also housed in the fuselage, under the rocket, gives the plane the look of an over-and-under shotgun. It also gives it optimum performance at lower altitudes. During enemy attack, when warning time is adequate, the 177 can cruise out to the area of interception, thereby keeping the battleground as far from the target as possible. In case of short warning time, the rocket and turbojet can come into play together and thrust the vehicle at high-climbing speeds into enemy formations. The SR 177 carries search-and-kill radar and is armed with infrared-guided Firestreak missiles which home in on heat generated by enemy aircraft. Air to feed the turbojet is taken in through a chin intake that can be varied in shape and size to control intake volume. The nose houses radar equipment. An air duct runs back to a de Havilland Gyron Junior turbojet—an engine generating thrusts between 8000 and 10,000 pounds. The rocket, a Spectre, is made by de Havilland's rocket division. It has a variable-thrust output, using the same fuel as the turbojet—kerosene, with hydrogen peroxide for the oxidizer. The cockpit is conventional and eventually will be replaced when adequate electronic equipment becomes available. The windshield over the pilot's head has a streamlined, low-drag V-front, and an ejection seat fitted for supersonic escape. Because of the high thrust-to-weight ratios, the operational characteristics of the 177 include the ability to land and take off on grass strips. ★ ★ ★

Manned Missile





Iron-artist Martin Shaffer holds one of his metal masterpieces, a screen for a sportsman's trophy room. Shaffer also produces custom-designed fireplace screens (below), lamps and furniture

Pictures in Wrought Iron

By Robert M. Hyatt

EMPLYING IRON and fire as his basic materials, Martin Shaffer of Taos, N. Mex., produces beautiful "paintings" that are virtually indestructible. For seven years he has been a wrought-iron artist, developing and perfecting a medium that has become popular.

Shaffer attains great delicacy and the feeling of space in his creations. No subject seems too difficult for him to render a masterful interpretation.

"I follow the old-school method of realistic design," he explains.

Shaffer begins his designs, which are mostly on assignment, by making at least three preliminary pencil sketches, each an improvement over the other. Then he discusses each with the customer.

Much of his output is commissioned for the interior and exterior decor of homes, churches and public buildings. He plans not only for beautiful but functional effects. Often he is guided in his creations by the design of the room in which the piece is to be installed, its furnishings or, to a lesser extent, the preferences of the customer. The mountain-sheep decoration, above left, is in the trophy room of a sportsman's home.

Once a design is decided upon, Shaffer draws a layout on the smooth concrete floor of his studio, which looks more like a blacksmith shop. From there on, the floor sketch is his guide. With a torch, he cuts out the iron to match the lines of his drawing. Tiny lines in a finished piece appear to be made of fine wire. But this is never the case: Every piece is hand-cut. Bas-relief effects are often built up with the torch, others are attained by hammering. The rough edges are filed off.

On some pieces, such as fire



screens, Shaffer works his wrought-iron design over a fine steel mesh.

Besides wall designs and screens, Shaffer makes lamps, furniture, chandeliers, gates and balcony railings, exquisite scrollwork, as well as various types of hardware. He has made branding irons for ranchers and once supplied a local shoemaker with steel arch supports for orthopedic shoes.

Recently, he and two assistants were commissioned to create a novel sign for the front of a Taos mining company office. It is a huge iron bird of Indian legend flying across a large sunburst medallion, outlined with two enormous steel rings. It's the biggest job he ever tackled, although he is now working on wrought-iron murals.

Another idea he has been toying with is the incorporation of iron with various other metals to provide color and contrasts—such as the use of copper for reds, gold for yellows, and silver for whites.

Shaffer holds a bachelor's degree in art from the University of New Mexico. He also studied at the Chicago Art Institute and the New York Art Students League. ★ ★ ★



Other examples of Shaffer's work include wall pictures showing Arizona's Monument Valley and a figure beside a waterfall

One of the artist's biggest jobs was an assignment to make a huge "sunburst" sign for a mining company





Take-Apart Boat Fits in Car Trunk

Light enough to be handled easily by one man, a new take-apart boat can be stored in a clothes closet and carried in the trunk of a car. The molded mahogany hull is made in two pieces which can be joined in less than 30 seconds. The quick-release joint is sealed with rubber. Two models are available, a seven-foot single seater and a 10-foot two-seater.



Spray Gun Applies Foam Insulation on Walls of Building



Chemical foam insulation can now be sprayed on walls and ceilings of a building. Spray equipment developed by the Minnesota Mining and Manufacturing Company uses three separate lines—one for the chemical, another for a catalyst and the third for air. The materials are mixed in the chamber of the gun in a fraction of a second, picked up by the air and sprayed out to foam against the surface. The savings in the cost of application is expected to offset the higher price of the material.

Navy Tests Plastic Cabin To Increase Ship's Stability

Warships with plastic upper-deck structures may result from a Navy test of a plastic cabin on the destroyer, *Southerland*. Comdr. J. F. Felter, the skipper, reports the 10 by 10-foot structure is much cooler than a steel cabin in hot weather. The plastic cabin is adjacent to the bridge of the ship. The Navy hopes plastic structures can be used to reduce topside weight and increase the stability of ships.



Unloading was a family affair. Janet pitched down the gear, while the kids and I toted it to the campsite

Four Weeks of Camping on a Family Budget

We learned firsthand the troubles and joys of campers during our 7500-mile tenting tour of the West

PART I

By Joseph N. Bell

WE CAMPED OUR WAY 7500 miles in four weeks on less than \$500. We learned that a family of five can see the country inexpensively, using camping equipment and camp facilities. We also discovered that thousands of American families are trying it—with mixed success. It isn't a project to undertake carelessly; but done with know-how and the right equipment, it can be a rewarding experience.

Here are some of the other things we learned, many of them contrary to our expectations when we started:

- There are two very different and distinct types of camping: vacation camping, where you select one site and spend most of your vacation there; and overnight camping, where your tent substitutes for a

There's a new dimension to eating when you do it beside a magnificent mountain stream in Yosemite





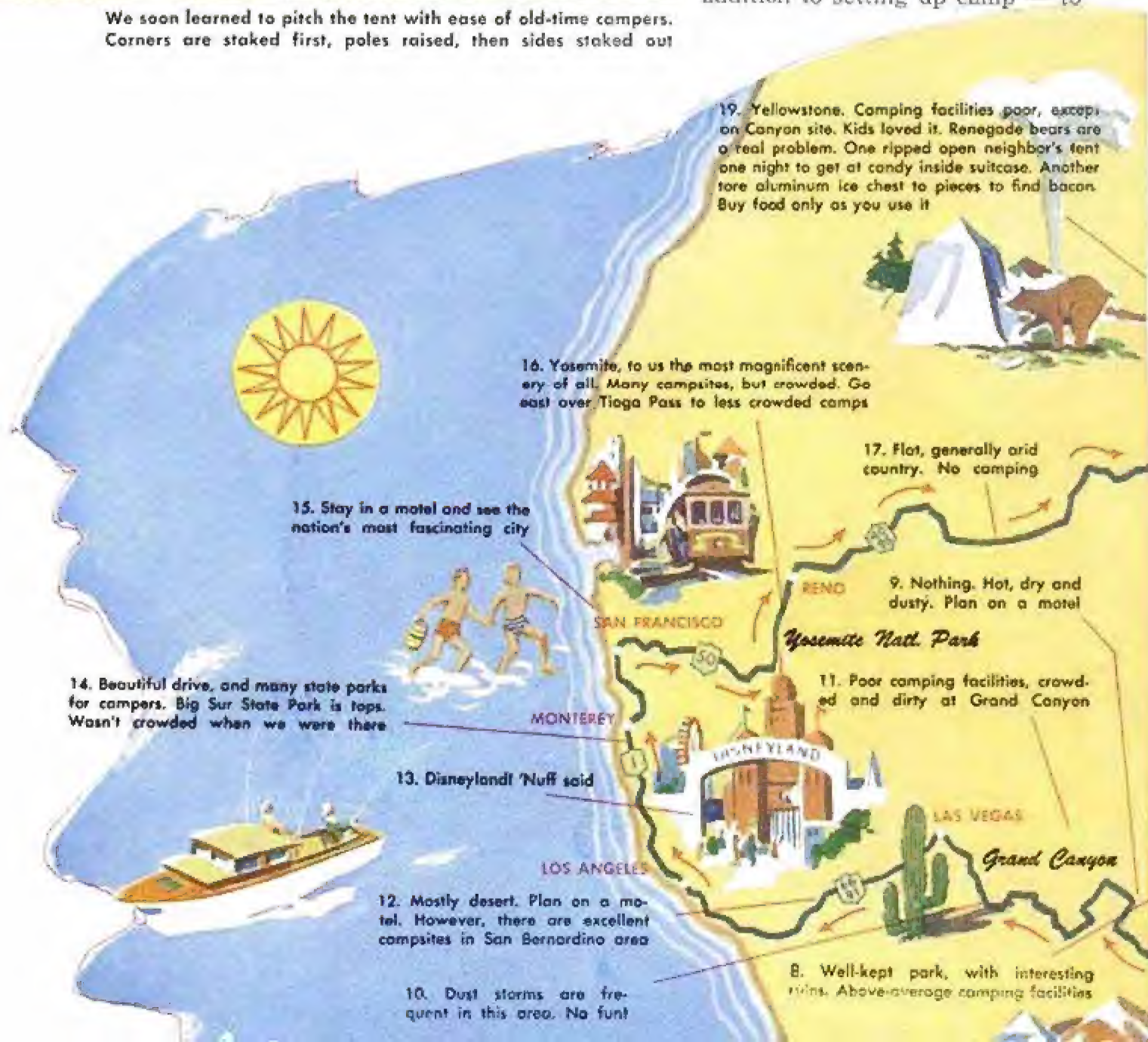
We soon learned to pitch the tent with ease of old-time campers. Corners are staked first, poles raised, then sides staked out

motel. Although most of our camping was the latter type, we tried both. Different kinds of planning, thinking and—to a limited degree—equipment, were required.

● When you camp with a family, good water and reasonably clean sanitary facilities are necessities—found only on posted public campsites. But, unhappily, many public-camping facilities are a far cry from the green and sparkling wilderness you are likely to picture when you think of camping out.

● Good camping facilities are not spaced evenly about the country for convenient traveling; rather they are bunched together, making continuity in camping on a long trip difficult.

● Camping equipment can be used in many auxiliary ways—in addition to setting up camp—to



save you time and money on a long trip. Thus the best answer is often a judicious combination of camping and motels.

● The largest single expense in traveling with a family is food. By carrying cooking equipment and using it consistently, we were able to pare eating costs to the bone. (We ate only three meals in restaurants during our entire four-week trip.)

● The extremes in weather in the United States, even in mid-summer, are tremendous, and the camper must be prepared for them.

● A motoring vacation with camping equipment can be fun and can be done economically if you plan it properly and know what to expect.

There are five of us: my wife Janet, myself and our three



Repacking is campers' hardest chore. Gear is heavier going up than coming down. But you can look forward to next stop

20. Our last mountains and a pleasant surprise. Beautiful country and a number of uncrowded camping areas. We'd like to come back

3. First motel stop. With owner's permission, we moved kids' sleeping bags into room. Saved \$6. Found we could do this at almost every motel

21. Stopped at friends' ranch. Camping trip gives you time to look up many old acquaintances. Kids helped round up calves

2. Stayed with farm friends. Not enough beds so we made up two in station wagon. This can solve sleeping problem anywhere

18. Beautiful, semimodern campsites in Grand Teton Park

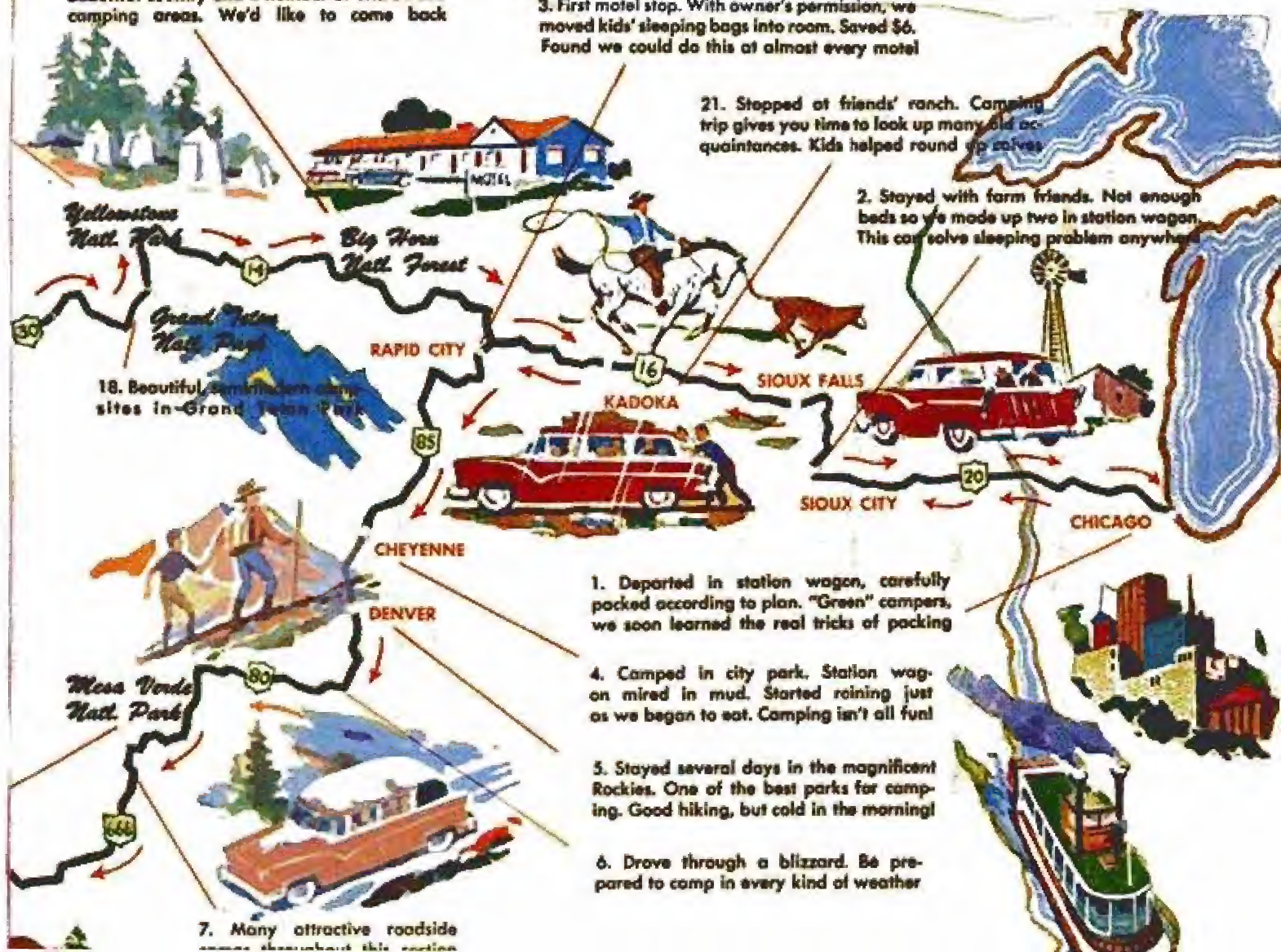
1. Departed in station wagon, carefully packed according to plan. "Green" campers, we soon learned the real tricks of packing

4. Camped in city park. Station wagon mired in mud. Started raining just as we began to eat. Camping isn't all fun!

5. Stayed several days in the magnificent Rockies. One of the best parks for camping. Good hiking, but cold in the morning!

6. Drove through a blizzard. Be prepared to camp in every kind of weather

7. Many attractive roadside camps throughout this section

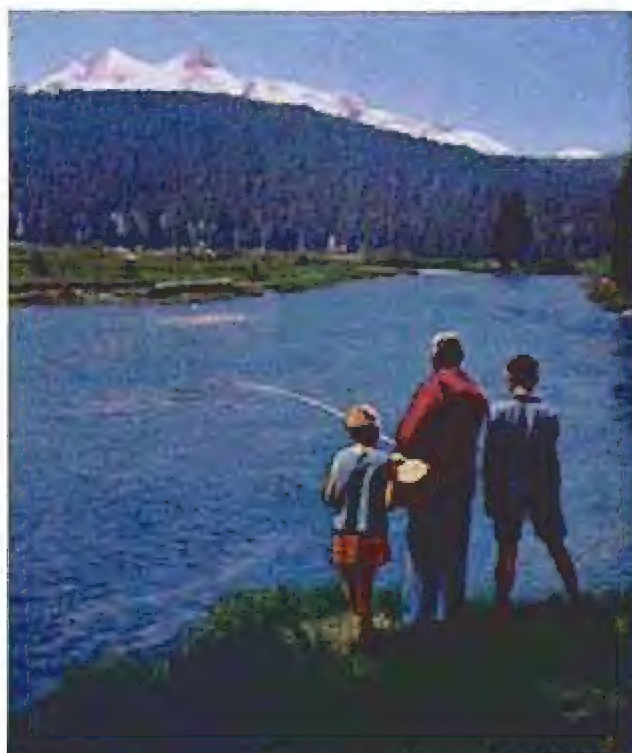




Kids seem to be the same at home or in camp. They watch while Mom "sweats over a hot stove", Dad unpacks

children—David, 12, Patsy, 9, Debbie, 6. From our home in La Grange, Illinois (a Chicago suburb) we've looked longingly at the West Coast, come vacation time, for quite a few years. When *Popular Mechanics* expressed interest in buying a couple of articles about the trip, we were delighted. We decided the children were old enough and our pioneering spirit strong enough to give it a try.

This is real peace, even when the fish aren't biting. In this setting it's fun just to look at the scenery



I managed some extra time off from work, which gave us four weeks to make the trip. But it took only a few minutes of figuring to see that we couldn't afford four weeks of eating out and staying in motels—plus all the other expenses of traveling. So we decided to take our motel and kitchen with us. We were not experienced campers. The only camping we'd done was when we pitched a tent on a friend's lake property during our vacation.

We bought our tent and some of the essentials then. From that experience and reading everything we could find on the subject, we assembled the remainder (see list of equipment bought at Sears, Roebuck and Company on page 101). The total cost of our gear came to \$387.87.

While acquiring our equipment we were also planning our route. We decided early to take any side trips that looked good to us. That's why we logged 7500 miles in covering what is essentially about a 5500-mile route. Once our general course was decided, we wrote letters to the states through which we planned to pass; all obliged with literature and maps. Colorado and California sent listings of camping facilities which were tremendously helpful.

From previous trips, we had learned to be governed by two cardinal rules in packing: Take as little as possible and, leave maximum room in the car for the kids to move around in. Fortunately our space economy didn't keep us from packing both cold and warm-weather clothing. We

needed it. During our four weeks on the road, we encountered blizzards, dust storms, hail, strong winds, scorching heat and all varieties of rain. We hit temperatures of 110 degrees in Nevada and 22 degrees in Wyoming, and our clothing had to be planned for these extremes. Warm-weather clothing was needed most frequently at that time of the year (June 10 to July 8); this we packed in an old fortnighter trunk which we carried behind the rear seat of our station wagon. Cold-weather clothing was packed in a canvas bag on top of the car with the camping gear.

We found that we had more packing and moving-about room in our station wagon if we left the rear seat in place and put the middle seats down. With this arrangement, we stored our luggage behind the rear seat, and the children had a choice of sitting on the rear seat or moving around in the middle of the car.

We carried all of our camping equipment on a three-foot by six-foot luggage rack on top of the car—an absolute necessity on such a trip. Just as important is a waterproof tarpaulin that will zipper tight to protect camping equipment from all sorts of weather. Our tarpaulin was a complete basket which we wired to the corners of the luggage carrier. It was 22 inches high and could be stretched higher in the middle.

As a final packing touch, we inflated two of our air mattresses and spread them over the open area where the middle station-wagon seats had been turned down. These served the dual purpose of providing the children a soft place to crawl around or sleep on and saved us inflating two of the mattresses when we camped.

Extra Beds in Car

Once on the road, we made two important discoveries our first two days out. We spent our first night with farm friends in Iowa. When we heard they were planning to sleep with neighbors to make room for us, we simply unrolled two of our sleeping bags and made beds for the girls in our car. Thus the first auxiliary use of our camping equipment. The second night we were to stay with another set of friends on a ranch in South Dakota. We discovered in mid-afternoon that rain had rendered the access road to the ranch impassable, so we had to go on. Unprepared for this setback, we hadn't checked on camping sites ahead. In a driving rainstorm and faced with impending darkness, we had to settle for a motel that night. Thus the need for emergency planning.

Our first overnight camp was pitched on the third night out—in the town of Torrington in southern Wyoming. Again we drove



COST OF OUR EQUIPMENT

ESSENTIAL

9' by 9' umbrella tent.....	\$92.50
Tent carrying case.....	6.97
Air mattresses (5).....	18.35
Single sleeping bags (3).....	59.79
Double sleeping bag.....	29.95
Propane two-burner stove.....	17.95
Propane lantern.....	10.46
Flashlights (2).....	3.18
Cooking kit (including cups and metal plates).....	9.96
Folding cloth bucket.....	2.98
Canvas carrying bag.....	7.97
Picnic kit (including two quart vacuum bottles).....	8.47
Hatchet	3.67
Propane refills for stove and lantern (6).....	9.00
Eating utensils	4.70
Screens for front windows of station wagon (2).....	6.78
Metal rack with disposable frying-pan inserts.....	2.98
Insect bombs (4).....	3.48

Total\$299.14

DESIRABLE

Aluminum ice chest.....	19.46
Sleeping-bag liners (washable) (5).....	14.35
Pillows (if you use them, you can probably find some old ones around home) (5).....	12.35
Army-surplus folding shovel.....	2.98

Total 49.14

OCCASIONALLY DESIRABLE

Camp table	25.47
Camp stools (5).....	10.65
Air pump (we found it faster to take turns blowing up the mattresses)	3.47

Total39.59

TOTAL COST OF SUPPLIES.....\$387.87



Debbie and sheep were mutually surprised to bump into each other on this road across magnificent Wyoming

most of the day through country that offered little to the camper—flat, semiarid ranch land. With Estes Park, Colo, too far ahead to reach that night, we finally stopped at a Wyoming ranch house and asked the rancher if we might camp on his land. He was agreeable, but not enthusiastic and we decided to go farther. At last, in the town of Torrington, we found a city park where camping was permitted.

Everything Went Wrong

After what we encountered that first night of camping, nothing seemed difficult the rest of the trip. The car got mired in

Most parks have campsites with ready-made facilities. Usually there's a table and benches close by your tent



the park mud and had to be dug out; it began raining in torrents just as we sat down to eat; the toilet facilities were very bad; the insects ate rapaciously off us; and a group of fishermen—parking just a few feet from our tent—aroused us about 3:30 in the morning. It was an inauspicious beginning which gave little hint of the pleasure and beauty that lay ahead of use.

After Torrington, everything was downhill the rest of the way to Los Angeles. We camped the next night in the magnificence of the Colorado Rockies in Estes Park, where we liked it so well we stayed several days. Then came a delightful little state park in central Colorado near Canon City, followed by Mesa Verde National Park, a motel in Gallup, N. Mex., and the Grand Canyon before we pulled into Los Angeles—experienced campers just 11 days from home.

California is the mecca of the camper. Here, campsites abound, parks are well attended and the scenery is magnificent. Even around cities, campsites are available. We put up in the San Bernardino area east of Los Angeles, from where we were able to drive into the city and see the things we wanted to see—including Disneyland, making the whole trip worthwhile to the children.

Irresistible Campsites

Pushing north from Los Angeles, we took three days to make the 400-plus miles

to San Francisco because we met up with two irresistible state park campsites of contrasting charm. The first was planted squarely on the ocean just north of Santa Barbara, nestled against a backdrop of coastal mountains. The second was just south of Carmel—a state park called Big Sur, where mountain streams gurgled profusely through a cool and inviting land of giant trees, sandwiched between ocean and mountains. Here, better than anywhere else on the trip, we found the least amount of conflict between the raw offerings of nature and the invasion of men with tents.

Traffic Congestion

After a motel in San Francisco, we pointed our nose east again into the breathtaking splendor of Yosemite Park. Hitting here over the 4th of July holiday, we found traffic congestion in Yosemite Valley as rugged as rush hour in downtown Chicago. Campsites numbered in the thousands — and they were all full. Here we found that the rangers mean what they say when they restrict camping to posted campsites in our national parks. In desperation we pulled off onto a side road and put the female contingent to sleep in the back of the station wagon while David and I crawled in our sleeping bags out under the stars. We were barely settled when we were routed out by rangers who insisted we go to a campground, even though they were full. We finally spent an uneasy night crowded between two already established tents, much to our neighbors' annoyance.

Beautiful Tioga Pass

From the Yosemite Valley, we wound our way across the rugged and incredibly beautiful Tioga Pass on an ancient and devious mining road. On the way, we saw some almost-virgin campsites, one nestled by a bejeweled lake on top of the pass. Had

we known they were there, we could have put in a much more comfortable and enjoyable night.

Leaving Yosemite, we crossed Nevada and Idaho into the Grand Tetons and on to Yellowstone. Here, we pitched camp for three days in a spanking new campground near the Grand Canyon of the Yellowstone. Facilities were not crowded; the major problem was the bears, a segment of whom have lost all respect for people and scavenger at will throughout the Yellowstone campgrounds.

Damage by Bears

We were careful not to keep fresh food around our campsite, but several of our neighbors weren't so fortunate. One family lay, frozen in fright, while a bear ripped the side out of their tent one night, ambled inside, tore open a suitcase and crunched happily on some candy bars hidden there. Another neighbor had an aluminum ice chest ripped to pieces by a bear who wanted the bacon inside. At Yellowstone, it's best to buy your fresh food daily—as you need to use it.

After Yellowstone, there was just one more night of camping before we reached the home of our ranching friends in South Dakota; from there, one night in a motel got us home—after 30 days, 7500 miles, and a first hand look at a large chunk of this vast and wonderful land of ours. For an investment of \$16.40 a day, we had seen the western United States in exciting close-up. We not only had an enjoyable vacation, but had felt our family grow as a unit as we worked and played together. Camping made it possible for us.

(NEXT MONTH: A look at our national parks, breakdown of expenses on a camping vacation, and some tips on how to get the most in economy and comfort from your camping expedition.)

In this picture, Janet and I are hoisting the poles inside the tent while the kids stake down the corners





For Campers

For those who like a few of the comforts of home while roughing it, here is a lightweight collapsible chair. This portable piece of furniture weighs only 24 ounces but it's engineered to support 300 pounds of camper

Himalayan Pak Co., 482 Asbury, San Jose, Calif.



Below, leave dishwashing chores at home when you head into the great outdoors. For three dollars (plus postage) you can buy eight disposable 10-inch pans and a holder. Pan refills cost less than a dime

Morsan Tents, 10-27 50th Ave.,
Long Island City 1, N. Y.



←Vacationers, as well as hunters and fishermen, can convert a station wagon into outdoor sleeping quarters with an insectproof enclosure. The enclosures of netting and canvas fit over the tailgate

Morsan Tents, 10-27 50th Ave.,
Long Island City, N. Y.



Designed to fit the floor of any station wagon, a new sleeping bag and mattress unit accommodates two adults or three small children. Made of mildew and moisture-resistant materials, unit weighs 12 lb.

Celaesee Corp. of America, 180 Madison Ave.,
New York City 16



Only five minutes are required to set up a portable outdoor room that encloses an area measuring $7\frac{1}{2}$ by $10\frac{1}{2}$ feet. The outfit includes a full-size canvas floor covering and an aluminum auto-top carrier. No tools are required to set up or take down the tent which is held on an aluminum frame, eliminating center poles

Kar Kamp Mfg. Co., 8025 E. Garvey Ave., South San Gabriel, Calif.



Suspended from an outside aluminum frame, another of the new tents can be erected in minutes without the use of ropes or poles. Available in two sizes, both are six feet high at the eaves. The smaller size has approximately 87 square feet of floor space and weighs about 40 pounds. The larger size weighs 55 pounds and provides about 138 square feet of space. Includes awning, water-resistant floor and nylon mosquito netting

Champion Canvas Co., 407 N. Eighth St., St. Louis 1, Mo.

Incorporating basic features of the packs used in the conquest of Mount Everest, a new 30-ounce pack has a self-adjusting shoulder harness for constant balance

Himalayan Pak Co., 482 Asbury, San Jose, Calif.

Tested against 60-mile-per-hour winds, a tent designed for mountain camping has a special lining which affords protection to 30 below zero

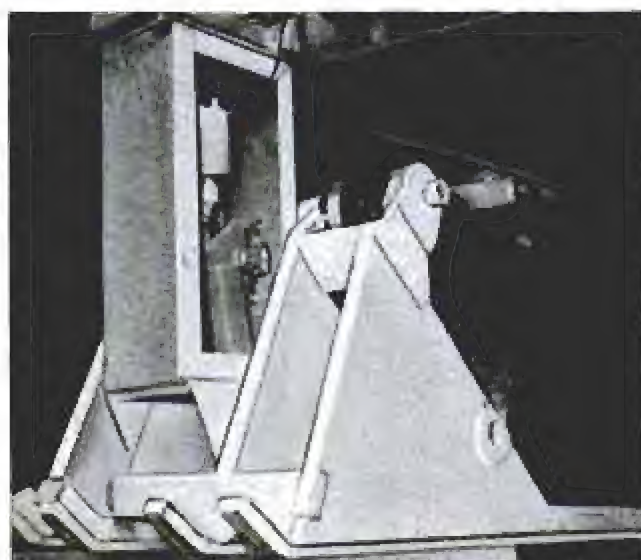
Porta Co., Inc., 32 Neponset St., Canton, Mass.





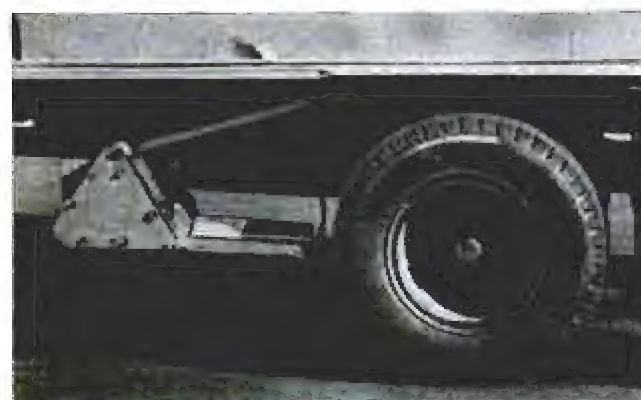
Radio Controls on Tractor Replace Hired Hand

As the tractor replaced the horse, electronics may replace the hired hand on some farms. An English farmer has taken a step in that direction by equipping one of his tractors with radio controls. The radio equipment, plus hydraulic pump and pistons, operate the clutch, steering gear and plow controls. A master switch stops the engine in case of emergency. A series of three lights connected to the robot tractor's steering mechanism show the position of the wheels. It's all controlled by a radio transmitter in the lead tractor.



"Sleds" Under Rear Wheels Are Emergency Truck Brakes

After three narrow escapes due to brake failures on the trucks he operated, Kirk Besoyan of Los Angeles decided to do something about it. With the help of a brother, Serg, he invented an emergency truck brake. It consists of a set of steel runners attached to the underside of the truck or trailer, directly in front of the rear wheels. When his regular brakes fail, the driver flips a switch on the dashboard and the runners, or sleds, drop to the highway in front of the wheels. The wheels roll onto the sleds which drag the rig to a slow halt. Rollers help prevent jackknifing.





Children play in the back seat, surrounded by safety nets. All the interior surfaces have been padded

Safer Station Wagon for Family Driving

CALLING UPON his experience in medicine, Dr. Johan V. Hultin of San Francisco, Calif., has redesigned a standard station wagon to make it as safe as possible. The alterations cost him about \$200, and he feels it is a small investment to protect his family. The only change in the exterior of the car is the front bumper, which now is held in place by four 15,000-pound shock absorbers. He believes this hydraulic bumper could withstand the force of a 40-mile-per-hour collision and leave the auto undamaged. The entire interior of the car

now is padded. Safety nets cover the roof and rear windows and doors to protect the children. Crash helmets are on hand for all occupants. The front seat is equipped with safety belts and shoulder harnesses. Nine rear-view mirrors give the driver greater visibility. There's a fire extinguisher within reach, and the steering wheel is covered with a crash pad. However, Dr. Hultin advocates easily manipulated hand grips rather than a steering wheel, which he considers one of the principal causes of injury.

Front bumper is backed up by four hydraulic shock absorbers which would ease the shock in a collision

Fire extinguisher, seat belts, shoulder harnesses, crash helmets and padded wheel contribute to safety



The Changing Face of the Philippines

By William D. Brinckloe

America's showcase in Asia—otherwise known as the Philippine Islands—was demolished by bombs during World War II. Two thirds of its industrial plants were reduced to piles of rubble. Author William D. Brinckloe gives an inspiring first-hand report of a mechanical revolution that is accomplishing miracles in the land of the Moro outlaws where the water buffalo once roamed



Vicente Araneta invented this "Arawheel" tractor which can maneuver in a flooded rice paddy buried to the crankcase. This mechanical marvel drags a hidden cultivator behind it



AS THE STEAMER cleared San Bernardino straits, Flor Enrique put aside his loneliness for the Philippines, and dreamed of his future. Electronics engineer from Manila's Mapua Tech, he had been hired by an American engineering firm on Guam. Flor didn't know it, but he and his 19 fellows were making history of a sort—the great U. S. actually was importing engineers from the Philippines.

Mike Banuvar of Vinnell Corporation took it calmly, too. "Just good business," he said. "Technical education in the Philippine Islands has come so far that these young engineers are hot—it makes sense to hire them."

With 4,500,000 of her 21,000,000 in school, education in the young republic is booming as nowhere else in Asia. Far East University's 25,000 students make her largest in Asia and in the first 10 worldwide. University of the East, new since the war, already boasts 19,000. And for a leavening of tradition, Santo Tomas is older than



Filipino farmer astride his water buffalo gazes in wonder at new industrial plants in suburb of Manila

Harvard and her crack cadet corps' bearskin buskins and scarlet tunics would do credit to Buckingham Palace. I saw why the bustling archipelago was chosen for Asia's \$20,000,000 international nuclear center.

When *Popular Mechanics* asked me to get the story of Philippine recovery, I little realized the ferment transforming the islands. At war's end the cities were virtually demolished, two thirds of the physical plant wiped out, the economy destroyed. Today it's a vastly different story.

"I'm with Reynolds Metals," said my seatmate as our airliner left Honolulu. "Going out to open our \$3,000,000 aluminum plant." He was former Governor Keen Johnson of Kentucky, and he was sold all the way.

"They have a stable government," he went on, "they're friendly, and they've got technical talent that can make this the industrial heart of Southeast Asia. We're teaming up with local capital to get in on the inevitable growth of this strategic area."

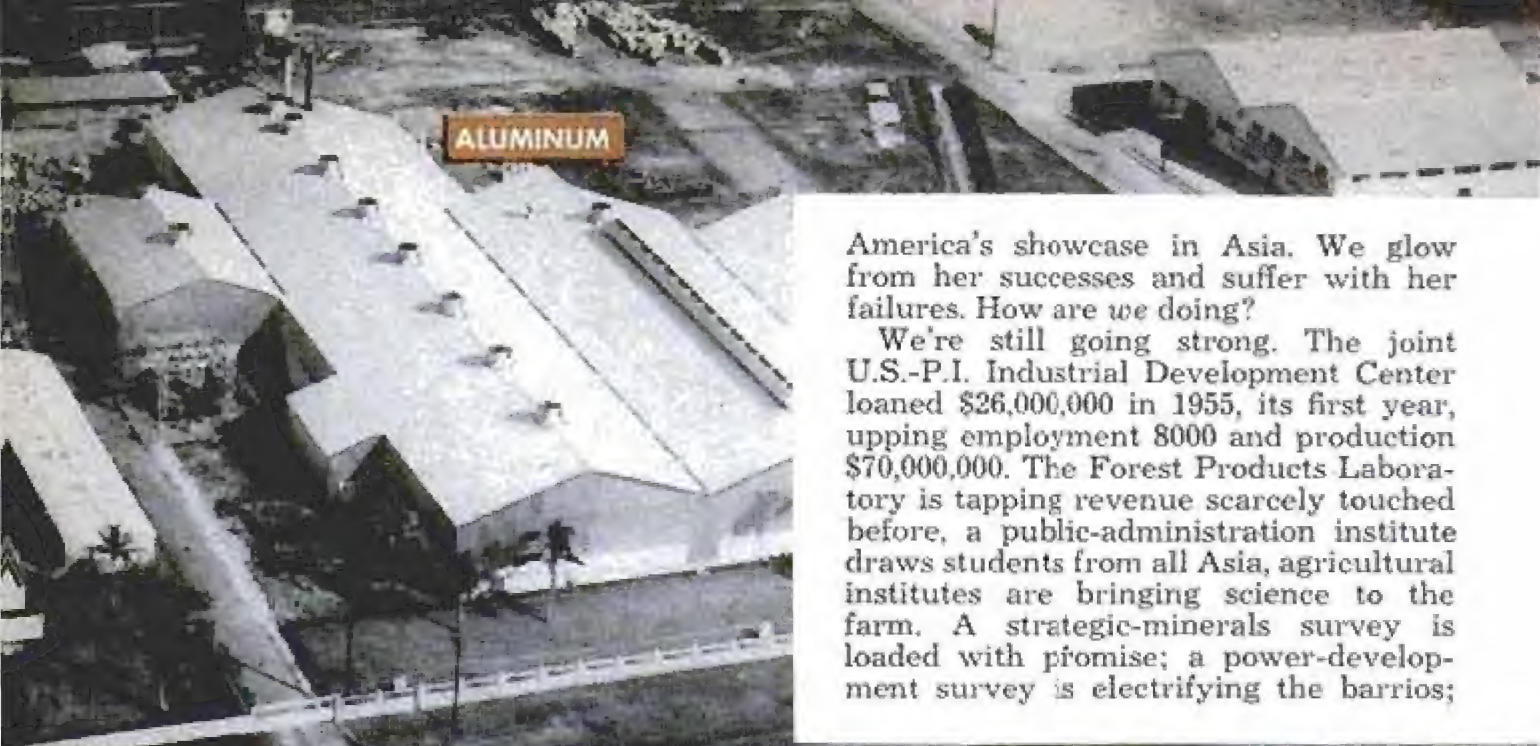
"We're opening a plant in Bulacan," said Bill Meichner of Columbia Paints from

across the aisle. "We're sharing with Filipino capital, too. Can't meet our growing market from the States."

Down in the lounge I met Neldon Hoyt of L. D. Seymour, making a host of once-imported items. An electrical contractor told of contracts swamping his and other firms — \$30,000,000 in new textile mills, three big drug plants, tire plants for the Big Three of rubber, to handle Philippine crude. I learned of Union Carbon and Carbide's marriage with P. I.'s aggressive National Power to produce scarce fertilizer; of Philippine Corn Products' glucose plant, first in the islands.

And I learned of oil, black gold whose lure has a U. S. company and a local consortium racing feverishly for a strike. Oil is there—an extension of the rich Indies fields — and Mid-East pressures promise sweet rewards to the finder. Caltex' new Batangas refinery, and those planned by Shell and Stanvac, all are betting on a strike. The islands are doing fine now — add oil, and they're home in a breeze.

The new republic, nurtured in democracy and freely given independence, is



ALUMINUM

America's showcase in Asia. We glow from her successes and suffer with her failures. How are we doing?

We're still going strong. The joint U.S.-P.I. Industrial Development Center loaned \$26,000,000 in 1955, its first year, upping employment 8000 and production \$70,000,000. The Forest Products Laboratory is tapping revenue scarcely touched before, a public-administration institute draws students from all Asia, agricultural institutes are bringing science to the farm. A strategic-minerals survey is loaded with promise; a power-development survey is electrifying the barrios;



PETROLEUM

ROPE



IRON

and a comprehensive water-resources survey promises pure water for the towns and irrigation for the farms.


U. S. Senator Ellender's report on our worldwide-assistance programs — "some good, some bad, some . . . ridiculous" — says enthusiastically that the program here is "very impressive . . . actually, very little money is being spent by us on such programs. We start them, create interest, and the rest . . . is carried on by the people through mutual help." He proudly cites our proposal to close the Iloilo information office, and the Filipinos' offer of financial help to keep it open!



COPPER



SUGAR



PLYWOOD



Ambuklao, biggest rock-fill dam in the world, was completed last year as first of six in northern Luzon

The postwar Hukbalahap rebellion, spawned among tenants sucked dry by absentee landlords, and fanned by the communists, nearly sank the country. Magsaysay saw that land oppression was keeping the movement alive, so he started a resettlement that has given homesteads to 20,000 and, at the time of his death, was pushing roads through lush Mindanao to open up farms for 200,000 more. The usury and antiquated markets that plagued the poor are being ended by ACCFA, government cooperative that since 1954 has set up 400 rural marketing centers and brought the small farmer cheap credit. A \$3,000,000 pilot cotton plantation in Mindanao provides its 100 proprietors with all implements and seed—even airplane dusting. This is suggestive of Russia's collective farms, with the vital difference that government and private enterprise are partners. At present 150,000 spindles are taking Indian cotton and local growers want a slice of this lucrative market.

Coconuts "Feed" Millions

Eight million Filipinos live off the coconut industry. Copra is the No. 1 dollar earner, and Philippine copra has been the worst in the world. Ildefonso Galang owns six hectares (about 15 acres) of Cotabato coastland, and his four-year-old trees (with his garden and a few pigs) bring him a scant \$250 a year—from the nation's richest industry. Hence the Coconut Administration's stern ruling that after April 1955 no substandard copra could be exported, for only thus could they shock their improve-

ment program down Ildefonso's throat. Field teams drummed the rules for quality copra production. Fifty coconut companies were born, buying fiber for wallboard, shell for creosote, water for vinegar—by-products which will more than double Ildefonso's take.

Ramie is coming back strong. The world's newest natural textile, it is also the oldest—mummies were shrouded in this forgotten cloth. Besides having seven times the strength of silk and growing stronger when wet, this prolific nettle gives six harvests a year. A \$3,500,000 all-Filipino corporation has been set up to exploit the "golden weed."

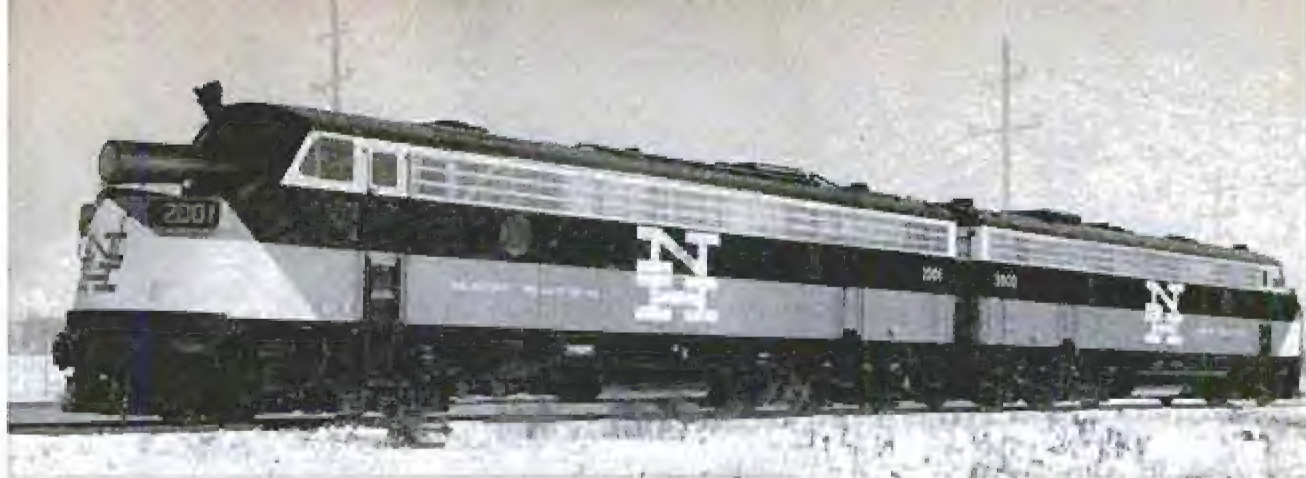
Coffee Can Be Mainstay

"Go west, young man—and plant coffee!" say experts to erstwhile Filipino pioneers. Coffee loves rich soil and proper elevation, both present in Tagaytay and Mindanao. Standard Brands is making quality Chase and Sanborn from the local bean. Coffee can be a mainstay of the future economy.

Vicente Araneta's new invention of the Arawheel gives tractors floating power in mud fields and permits mechanized tillage of rice paddies. Ford of England, with long tractor experience in India, Ceylon and other rice lands, says it "exceeds the greatest expectations of tractor designers." With slow carabao (water buffalo) tillage \$133 per hectare, and Arawheel tillage only \$6.40, Vicente Araneta is the Eli Whitney of riceland.

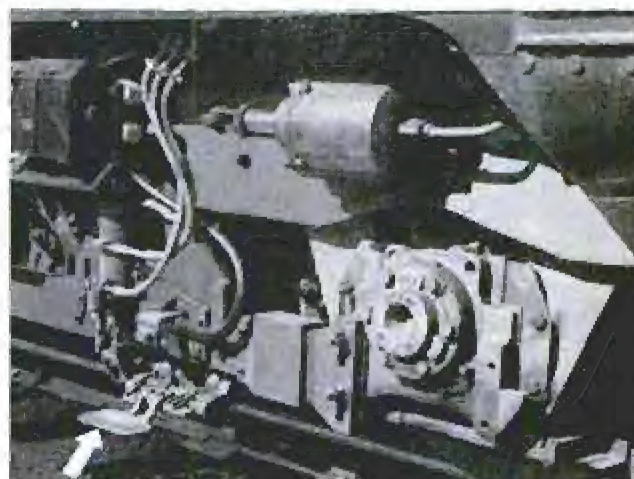
Bacalod City, proud capital of the sugar

(Continued to page 226)



Two-in-One Locomotive Uses Diesel, Third Rail

Full-range, dual-purpose diesel and third-rail electric locomotives have been combined in a single unit. Pulling passenger or freight trains, this two-in-one locomotive can leave third-rail territory and enter diesel area without even slowing down to switch from third-rail to diesel power, and vice versa. Third-rail shoe beam (arrow) is mounted between journal boxes. The locomotive has 1750 horsepower and a maximum speed of 89 miles per hour.



Prefabricated Brick Panels Used in Home-Building Test

Load-bearing panels of prefabricated brick have been successfully tested in the construction of a ranch-style house. The panels are one foot wide, eight feet long and 2½ inches thick. Each has 36 norman-face brick set in stack bond. At the site the panels were raised by a hoist equipped with a vacuum device and set in place on the

foundation without mortar. The panels, instead, were bolted to horizontal steel angles at the top and bottom of the wall. The vertical joints were mortared as the house approached completion. A crew of five men erected the prefabricated brick walls for the 1800-square-foot house in 8½ hours.





In the final weeks before the dam reservoir flooded the river canyon, diggers search for ancient treasure

TO ARCHEOLOGISTS it was an important pile of dirt.

According to Dr. Douglas Osborne, University of Washington archeologist who directed the Wakemap project, the mound was by far the choicest site in the region—the only stone-age site showing a long-term occupation uncovered in the Northwest.

About 1500 years ago a tribe of primitive people built a community on the north bank of the Columbia River 85 miles upstream from present-day Portland. Their descendants occupied this settlement until perhaps 1750 A. D. Through these centuries the rubble and refuse from their everyday activities accumulated in layers, eventually forming a broad, earthen mound.

Last year the University of Washington completed a five-year excavation of that mound. What they found gave scientists a complete chronology of the Northwest's prehistory, for Wakemap was an archeological timetable.

The excavators labored against time, knowing that very soon the gates of the new Dalles Dam three miles down-

stream were to be closed, flooding an eight-mile stretch of river canyon behind it—including Wakemap.

The first whites exploring the Northwest noticed the Wakemap mound. Lewis and Clark reached the mid-Columbia in the autumn of 1805. After portaging their equipment around Celilo Falls, they eased down the treacherous rapids below, where the river roared through restricted channels between outcroppings of volcanic basalt. Captain Clark noted: "... this place being verry bad I sent by land all the men who could not Swim . . . and proceeded down with the canoes two at a time to a village of 20 wood houses in a Deep bend to the Stard. Side . . . they are scattered permiscuisly on a elivated Situation near a mound of about 30 feet above the Common Leavel, which mound has some remains of houses and has every appearance of being artificial."

It was Wakemap mound, only recently abandoned.

A half-century later, pioneers traveling the Oregon Trail along the south bank of

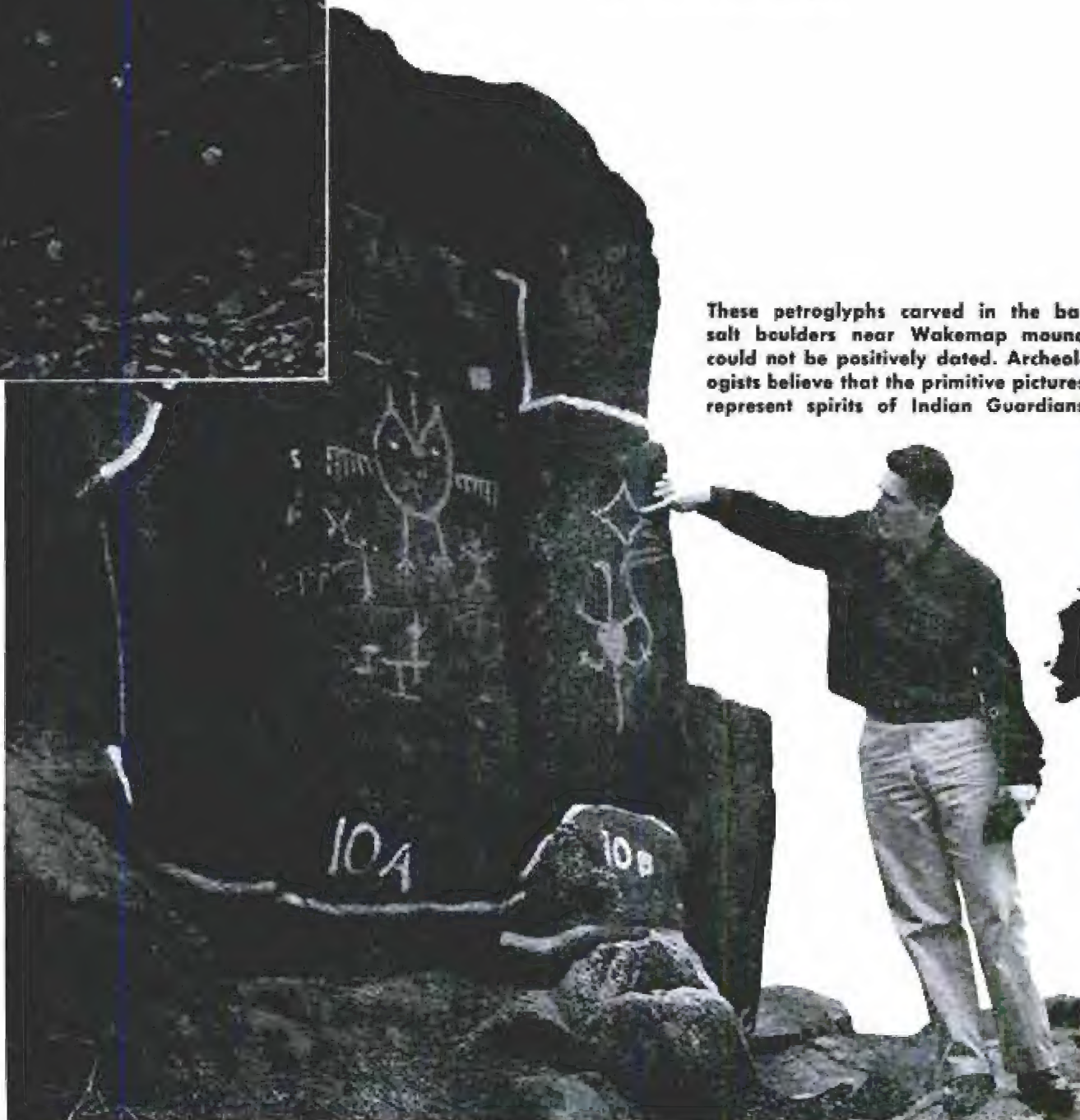
Last Look *Reprinted from Highlights* at a Forgotten Civilization

**Archeologists labored against time
to unearth the artifacts of a community
that had existed on the banks of the
Columbia River 1500 years ago**

By John Burroughs



These petroglyphs carved in the basalt boulders near Wakemap mound could not be positively dated. Archeologists believe that the primitive pictures represent spirits of Indian Guardians





Diggers found several small, crescent-shaped stone ornaments representing fish, sea otter or seals



Many hexagonal stone beads were recovered. It is not known what was used for a drill to pierce them

the river reported that Celilo Falls and the rapids below were the best fishing-ground in the West. Indian tribes came hundreds of miles to spear and net enormous catches of ocean salmon. To these Indians, Wakemap was a mystery.

In 1925 a team from the University of California, making an archeological survey of the area, dug test pits in the mound. They concluded that the site should be looked into.

But nothing was done until 1952, when construction crews began work on the Dalles Dam. Excavation fell to the University of Washington under a contract from the National Park Service. First, the top of the mound was bulldozed. The resulting flat was staked off in five-foot squares, and each square assigned to a pair of diggers. Students from the university did most of the shovel work. They sifted every cubic inch of dirt. Each artifact recovered was catalogued and its exact location plotted with scaled diagrams. Three rows of adjacent squares, 100 feet in length, were dug to bedrock. They gave representative data.

The uncovered artifacts reflected the progress of Wakemap's inhabitants. Stone, antler and whalebone objects found in the deeper strata were crudely worked implements. The utensils and tools from the higher, later strata were carefully carved examples of fine craftsmanship. In the top-most strata the diggers found many ornamental objects of personal decoration.

The diggers also discovered other promising locations nearby. In one, bits of hu-



This heavy stone bowl probably was a mortar used for pulverizing dried fish. The pestle wasn't found

man bone protruded from the earth. Investigation uncovered a series of round pits about eight feet in diameter, which at some early period had been used for food storage and in later centuries for cremation. Clinkers in the incinerated material proved to be some of the finest carvings discovered.

Other sites turned up. A radioactive-carbon test on organic material found on the other side of the river indicated that the canyon had been inhabited 9000 years ago. Tentative dating for the lower strata of the mound itself was established—about 1500 years old.

Crews arrived to blast off some of the many primitive rock carvings, or petroglyphs, chipped in the basalt canyon walls. The blocks of rock, some of them weighing 20 tons, were removed to museums.

In the final weeks, amateur archeologists from the Oregon Archeological Society pitched in to help. They kept what they found, with the university reserving the right to photograph and catalogue significant artifacts.

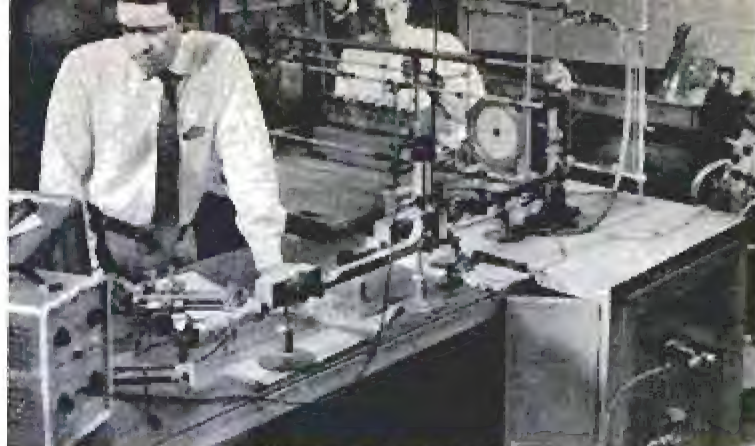
The deadline arrived. A dam engineer pushed a button. Four hours later the new Lake Celilo was 60 feet deep.

No one is certain who the people of the mound were. Dr. Osborne's guess at this point is that they were the ancestors of Indians living in the area when the first whites arrived. Epidemics swept the river in the mid-18th century. This may explain why the site was abandoned and why the later Indians knew nothing about their own ancestors.

★ ★ ★

100,000 M.P.H. Speed In Missile Laboratory

Shock-wave velocities of more than 100,000 miles per hour have been produced in a device called a hydromagnetic shock tube. The tube, built by Lockheed missile scientists to study ionized gases, also produces temperatures above 180,000 degrees Fahrenheit.



Rocket With Atom Warhead Could Destroy Bombers

One of the most devastating weapons to be added to the North American Air Defense Command's arsenal is the "Geni" air-to-air missile. It is capable of carrying an atomic warhead that could blast an entire formation of enemy bombers out of the sky. The "killer" rocket will be transported by McDonnell Aircraft's F-101B Voodoo, a jet interceptor that has been clocked at a speed of 1200 miles per hour.



British Airliner Seat Converts to Bed

Twin "Sleeperseats" are being used on some airline flights between England and Africa. The new lightweight chairs installed on the Bristol Britannia turboprop planes have three positions — for sitting, for reclining with an extended leg rest and for sleeping.



Manmade Plastic "Wool" Repels Water Like Nylon

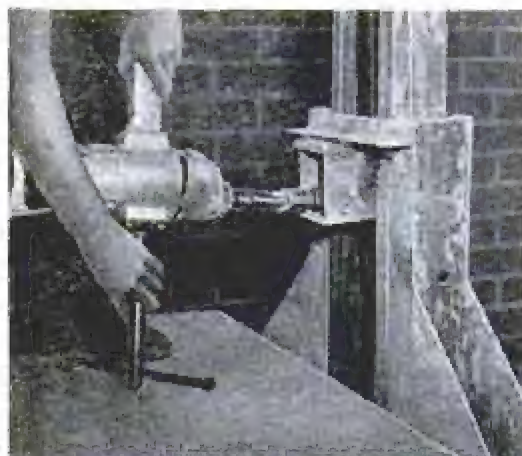
Besides costing less to produce than any other existing synthetic, there's a revolutionary, manmade plastic fiber called Moplen that looks and feels like wool, is water repellent and quick-drying like nylon, and can be ironed. Now in the final stages of development, the fiber will probably not be marketed for at least another year. Moplen, one of a series of new plastics "tailored" from propylene gas, can be produced at less than 15 cents a pound, which is less than one-fifth the cost of producing nylon.





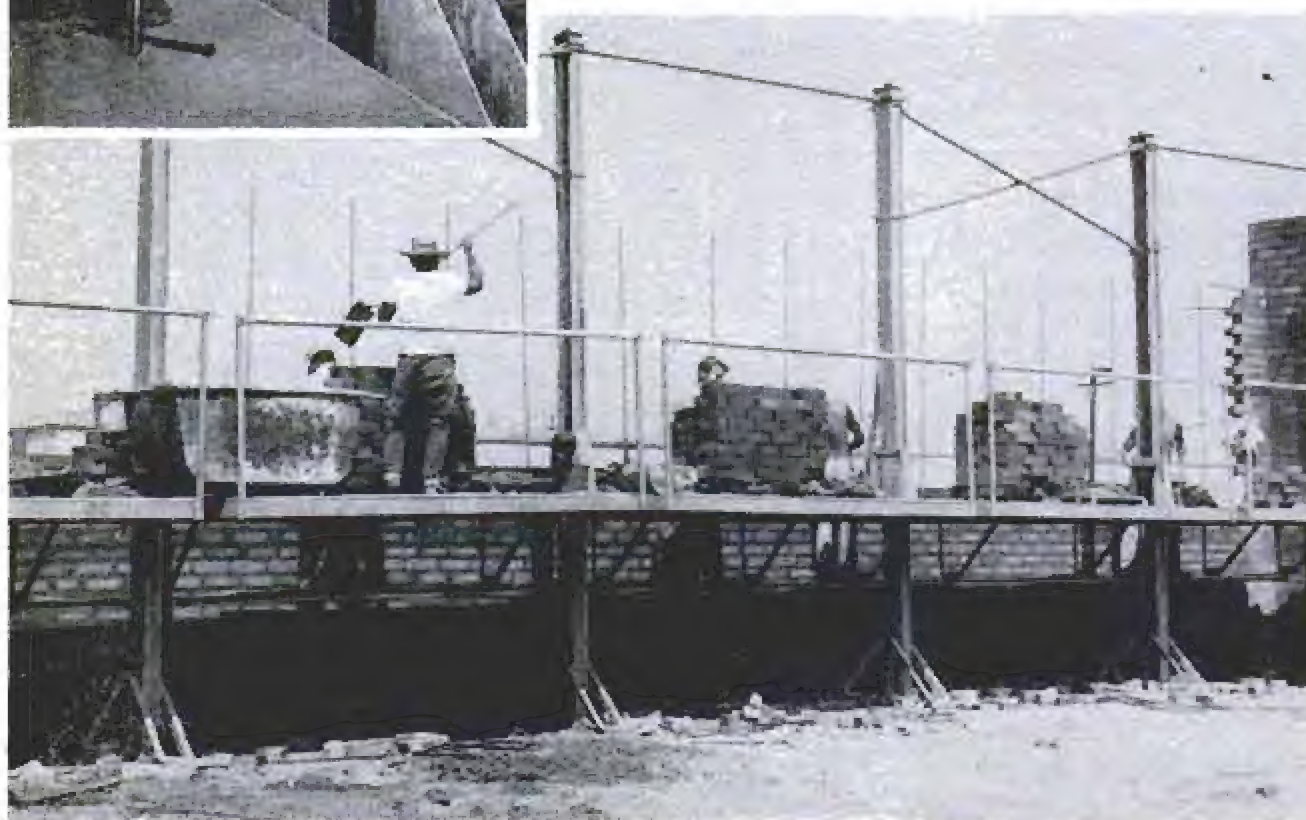
Portable Antitank Missile Launched by One Man

Propelled by a solid-fuel rocket motor, Britain's new antitank missile can be carried and launched by one soldier. The weapon weighs only 40 pounds and is housed in a weather and shock-proof box. It needs no external power supply or aerial.



Scaffold Operated by Power Drill Reduces Bricklaying Time

Controlled by a power-drill attachment, a new kind of scaffold can be raised or lowered to any desired level, even while loaded with men, mortar and bricks. By keeping the masons and materials at the most convenient working level, the scaffolding reportedly cuts job time in half.





Plastic shield protects operator from uranium powder as press punches out "preform" nuclear-fuel pellets

Atomic Pellets Fuel Belgian Reactor

ELECTRIC POWER will soon be produced from cylindrical pellets of uranium oxide about the size of cigarette filter tips. The pellets are being made for an 11,500-kilowatt atomic-power plant the Westinghouse Electric Corporation is building for Belgium. Several other nuclear-steam generators designed by the Westinghouse atomic-power department also will use fuel pellets. The pellets are prepared from a slurry of uranium-oxide powder and organic binders. The ingredients are blended in a king-size electric mixer. After the mixture has been dried, it is fed into a special automatic press which squeezes the powder into "preforms" that will not crumble easily. The pellets are then placed in special pans to be "baked" in a high-temperature sintering furnace. The sintering removes the organic material and strengthens the bonding force within the pellet itself. The sintered pellets are transferred to grinding machines which help shape them to specific dimensions. Each pellet is inspected for size tolerances of less than $\frac{1}{1000}$ inch. An automatic size tester flashes a yellow light if the pellet is too small and a red light if it is too large. A green light indicates the pellet is

the correct size. The pellets also are weighed on scales which can detect a difference of $\frac{1}{28,000}$ ounce. The pellets that pass the tests are inserted end-to-end in narrow stainless-steel tubes by automatic machinery. When the fuel-element rods are filled, the tops are sealed by welding. Westinghouse scientists report that although the uranium-oxide powder presents some handling problems, the pellet method of manufacturing fuel elements helps make atomic power economically competitive.

Finished nuclear pellets will be positioned end-to-end through entire length of fuel element rods





PORTABLE SUN SHELTER can be carried to beach, picnic grounds or on holiday trips. It has an aluminum framework, nylon canopy and weighs six pounds. Shelter accommodates three adults or four children

THE WALTERS Co. Walter's Sun-Port Co.,
1922 Raymond Commerce Bldg., Newark 2, N.J.
2095 Davidson Ave., New York 53, N.Y.

BARBECUE KETTLE has smoke hood, electric motor and coupling, plus shaft and fork for barbecuing meats and fowl. The deluxe model also features laminated plastic-top cutting shelf and rubber tires

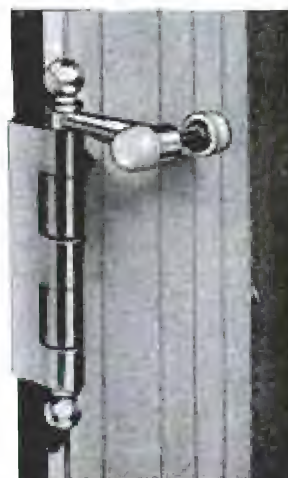
Weber Bros. Metal Works,
108 N. Jefferson St., Chicago 6

RIDER MOWER is practical for any lawn regardless of size, landscaping or terrain. With cutter removed, its "big tractor" features make machine usable for rolling, pulling a clean-up cart or plowing snow

Henderson Mfg. Co., Fisher, Ill.

ADJUSTABLE DOOR BUMPER fits on pin of door hinge, eliminating the necessity of drilling holes in floor or baseboard. It also eliminates rug-laying and mop-catching problems common with floor bumpers

Gordon Associates, Inc., First St., Derby, Conn.



WHAT'S NEW FOR 1955



CORN CUTTER cuts, scrapes and shreds in one operation. Five strokes can scrape a cob clean. Cutter can be adjusted to produce mash or whole kernel.
Lee Mfg. Co., Inc., P.O. Box 6682, Dallas 10, Tex.

LAWN AND HEDGE TRIMMER is powered by garden hose. It trims grass along walls or under shrubbery where big mowers can't reach. Trimmer has a four-inch, four-tooth rotary blade that is turbine driven 6000 r.p.m.
Master Specialty Co., Inc., 3727 Monitor, Minneapolis 26, Minn.



VACUUM MOWER, shown in two pictures below, picks up grass clippings and litter. Left, cover of plastic grass catcher is raised to show how clippings



POWER MOWER stores its gasoline in tubular steel handle. Mower also has a handle-mounted, one-knob operating control and fingertip height adjustment.
Appliance Div., Motor Wheel Corp., Lansing, Mich.



RUG BRUSH dry cleans tacked-down carpeting with absorbent compound. Brushes, above, revolve toward each other and upwards to raise and unmat pile. Unit lifts dirt and compound to surface, then vacuums.
Racine Industrial Plant, Inc., Racine, Wis.



are collected. Suction-lift action of rotor pulls up clippings and litter and, by unique baffle system under engine platform, forces them into the catcher.
Jacobson Mfg. Co., 747 Washington, Racine, Wis.





Before an applicant can make a run on the Santa Monica, Calif., course, his bicycle undergoes inspection

Start Something in Your Town: TEACH BICYCLISTS HOW TO LIVE

By Richard F. Dempewolff

JOHN HORAN, physical-training teacher at Post Road Junior High School in White Plains, N. Y., was heading for a swimming class one fall day a few years ago when near-tragedy halted him in his tracks. Two boys riding side by side on

their bikes had stopped at the intersection ahead of him. A third cyclist, clowning, came weaving down the street from behind and zipped between the pair. Intent on startling his buddies, he failed to notice a car on the cross street start through the

DO'S FOR BICYCLE RIDERS



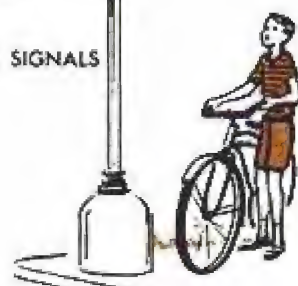
SIGNAL EVERY TURN

1. Keep to extreme right side of road; 2. Use same signals as car drivers (left hand straight out for left turn; up, right turn; down, stopping); 3. Signal at least 40 feet before stopping or turning; 4. Obey traffic lights; 5. Keep both hands on handle bars and be ready to stop in any emergency; 6. Ride slowly and carefully in heavy traffic; 7. Watch out for parked automobiles backing from curbs or starting up, and for pedestrians stepping from behind cars; 8. Get off street or road for ambulances, fire trucks and police cars; 9. When driving at night, have white light at front and red light or reflector at rear

WATCH CARS PARKING OR LEAVING CURB



OBEY TRAFFIC SIGNALS





Photos courtesy Johnson & Johnson

Cyclists practice signal for turn. Each intersection of test course has various traffic problems to consider

intersection. With a screech of brakes and a metallic clatter, the weaving bike plunged into the car's front fender. A flailing youngster soared over the handlebars, bounced against the car's windshield with a sickening thud that turned the glass to frosted mosaic, and slid to the street on the other side of the car. White and trembling, the boy rose and dazedly began to brush the dirt from his jeans.

"By some miracle," Horan recalls, "the only thing bruised was his dignity." That freak accident, however, did something to Horan. "It provided the shove," he says, "that sent me headlong into a bicycle-safety

program that had been growing in my head for years as I'd watched the annual tallies of bicycle mishaps."

Twenty years ago, Horan explains, anyone who could wobble downgrade on a two-wheeler without removing the neighbor's fence en route was considered a passable cyclist. There were byways for practicing, few cars on the highways and lots of room for "involuntary" maneuvering. Today, some 54 million cars and 24 million bikes use the same roads, leaving no room—or time—for the whimsical squiggle of a novice or carefree cyclist.

In a single recent year, 30,000 bicycle

DON'TS FOR BICYCLE RIDERS

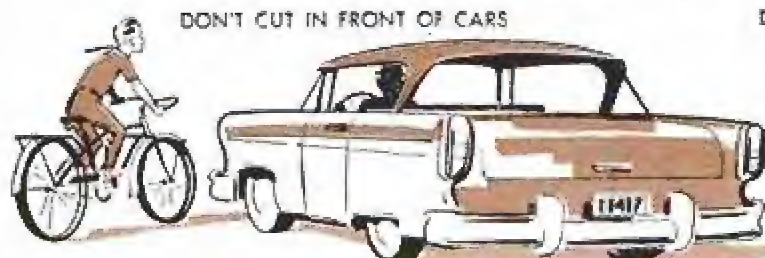


DON'T STUNT

1. Don't pass a vehicle when on a curve, hill or intersection; 2. Don't cut corners and don't cut closely in front of a vehicle; 3. Don't ride with more than one bicycle at your side; 4. Don't carry passengers on bicycle; 5. Don't ziptag or weave in and out of automobile traffic; 6. Don't "hook" rides on sides or back of a vehicle; 7. Don't ride closely behind a vehicle; 8. Don't ride on sidewalks or cut across lawns; 9. Don't park bicycle on sidewalks; 10. Don't perform stunts while riding; 11. Don't ride into a street without looking for pedestrians and vehicles; 12. Don't leave your bicycle unlocked



DON'T RIDE MORE THAN TWO ABEAST



DON'T CUT IN FRONT OF CARS



DON'T RIDE TWO ON A BIKE



Obstacle course of traffic markers tests rider's ability to control bicycle during sharp, repeated cornering

Layout of test course is shown below. Complete kit of instructions detailing methods of handling promotion, legal aspects and actual testing and licensing is available from Johnson & Johnson, 500 George St., New Brunswick, N. J. Brochures and data on safety rules and safe riding practices can be obtained from Bicycle Institute of America, 122 E. 42nd St., New York City 17

accidents claimed 480 lives—mostly youngsters. The accident Horan witnessed climaxed a grim period that saw nearly one bike calamity a day in White Plains, a suburban town of 50,000 about 20 miles north of New York. "In two weeks," he recalls, "there had been 12 mishaps—half of them hospital cases. Most violated a basic safety rule." A quick look at White Plains' police file bears him out. Comments like these on the case cards were commonplace: "Two on bike, lost control," "failed to stop at intersection," "no light or reflector," "hitching on truck," "riding left side at night," "no hands, lost control."

When Horan began to map out a program to beat these statistics, his idea was merely to make a game out of learning bicycle skill and safe practice for the kids in his own school. "I got the green light from our principal, Dr. Clarence Noyce," he says, "and with a group of volunteer youngsters we drew up a series of skill courses that could be painted on the playground in an area about 50 by 100 feet." Oral and written tests, like those given automobile drivers, were worked out. The plan, approved by the P.T.A.,



At check-out desk, cyclists get written and oral quiz and learn if they passed the driver's examination

went into effect with 200 children. The students drew the obstacle course to scale in mechanical drawing classes. City highway line-painting equipment marked out the final draft on the playground. At first, the youngsters picked their own leaders, testers and judges for the contests. "Those kid judges were tough, too," Horan remembers. "Bicyclists who passed got token licenses. Those who didn't had a chance to practice and try again."

It didn't take long for word to get around. Within a few months, White Plains public and school authorities picked up the ball and put in a compulsory bicycle-training program, based on Horan's "game," in every school in town. The public safety commissioner, then Frank Hanlon, and Police Chief William L. Sullivan, with the cooperation of other public officials, presented a bicycle ordinance to the common council, and it was written into city law. Every bicycle in town had to be licensed, and no permit to ride could be issued unless a child passed the required tests. A local automobile dealer gave the money for test courses, license plates, registration cards and the necessary police files. Patrolman Percy "Duke" DeLanoy, in charge of the city license division, took over the



Applicants doing "figure eight" must stay within 18-inch area between lines. Stopping, below, requires hand signal and full control of wheel to keep it from wobbling over lines and tipping





Traffic light was built in White Plains, N. Y., shop class of wood, coffee-can covers and iron pipe

job of official testing and annual issuance of permits and license plates. Today he is a miniature version of a motor-vehicle bureau. A 25-cent registration fee helps defray annual costs.

From that day in 1954, White Plains has not had a single bicycle fatality. Minor bike accidents, which used to run close to three figures annually, numbered 38 in '54; 35 in '55, 31 in '56 and will probably be in the low 20s when last year's figures are tallied. This, despite the fact that the town's population has zoomed in the same period.

Success Becomes Evident

As the success of Horan's bicycle safety program became evident, national organizations began to endorse it. Today, in more than 2800 communities throughout the country, you'll see bike riders running through test and obstacle courses in schoolyards during spring or fall months. Some use the obstacle course and game tests John Horan invented, now spelled out in a free how-to-do-it kit put out by Johnson & Johnson, the surgical supplier. Others follow similar programs available through the Bicycle Institute of America.

Drop by Post Road Junior High some spring or fall afternoon when officer Duke DeLanoy is running a group of applicants through the course. You will see quickly why the kids like the program. There's always a great "when do I get my turn" attitude—a clamor to earn the license.

An applicant logs in at the inspection desk, where his wheel gets a thorough check for brakes, handlebar grips, chain, tires, horn or bell, reflectors, headlight, general condition and size. Many bike collisions and tumbles are caused by loose

handlebar grips slipping off, with subsequent loss of steering control. And bicycle size is vitally important. "If a youngster can't straddle the bar and touch the ground with both feet, the bike is too big for him to manage properly," DeLanoy points out. "It's a cause of many falls—especially in traffic where a cyclist must stop for lights without tipping or wobbling."

If a bike doesn't pass inspection, a letter goes to the parents explaining the trouble and suggesting that when repairs are made a license may be issued. If it's too big for junior, he's told he must wait until he grows into it or until he gets one his size. "Parents usually cooperate," DeLanoy says. "And the kids get over their disappointment when they realize they'll have another chance later."

According to the ordinance, any bike with wheels larger than 20 inches is eligible for a license plate as long as it passes inspection. "Naturally," DeLanoy chuckles, "there's always the odd-ball nobody can foresee. One of the first wheels to come through was an adult bike, but it was a weird collapsible rig made in Japan. You could fold it up like an umbrella and put it in a suitcase. It had 18-inch wheels. We couldn't license it."

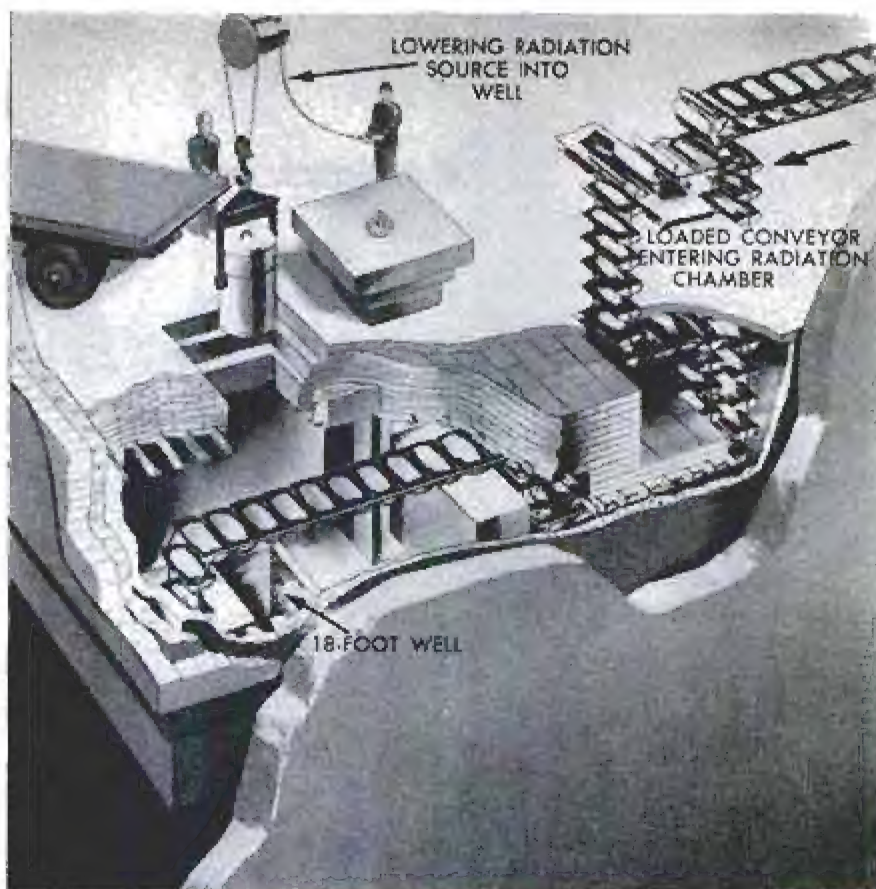
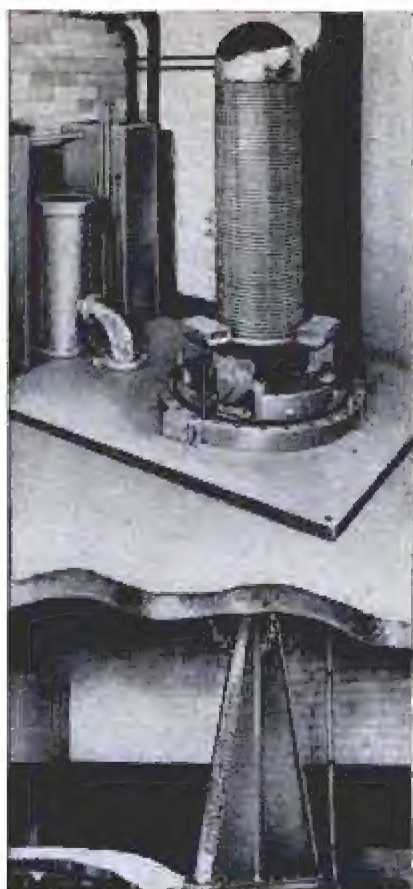
Only One Rider Per Bike

Another near-stickler was the ordinance prohibiting two on a bike. More bike accidents are brought on by this practice than by any other, and everyone in the White Plains program is solidly for the prohibition. "But darned if one antique-happy family didn't bring in an old tandem job for licensing," says DeLanoy. "In perfect condition, too. Fortunately we found enough leeway in the law to give it a special license as a two-passenger bike."

Once his vehicle has passed its test, the applicant moves into the road-test area, giving a hand signal as he veers right and heads down a narrow alley marked by parallel white lines 120 feet long and three feet apart. "One cause of falls and collisions is an inexperienced rider's tendency to wobble—frequently into the path of a vehicle approaching from behind," says Horan. "This course tests his ability to stay within narrow confines for quite a distance." Every 40 feet there's a marker where the rider signals, stops, puts both feet on the ground as he would in traffic, then proceeds—staying inside the lines.

Leaving the alley, the cyclist turns left into an obstacle course, made up of a row of rubber traffic markers 10 feet apart through which he must weave, without slowing down or knocking over any lane markers—to test his ability to maintain

(Continued to page 232)



Left, Van de Graaff generator irradiates food on conveyor. Right, irradiation plant using gamma rays

Radioactive "Pantry" Could End Food-Storage Problems

Some day you may be able to keep your steaks in a kitchen closet without fear of spoilage. The meat will remain fresh because it has been exposed to atomic radiation. High Voltage Engineering Corporation already has in operation a conveyor-belt system that moves food products beneath a Van de Graaff generator. The generator sprays the food with a stream of bacteria-killing electrons. Also being stud-

ied is a plan to bombard food, flowers, medicine and other perishable products with gamma rays from a uranium-products source. The source of radiation would be lowered into a well-shielded vault through which a conveyor belt loaded with perishable products would move. Food subjected to these atomic barrages, according to Dr. Wolfgang Huber, an expert in this field, does not become radioactive.

Deaf Converse Through Finger Tips and "Piano Key" Instrument

Deaf persons can communicate through their sense of touch with the aid of a new "piano key" instrument. The speaker operates the keys while the listener rests his fingers on vibrating diaphragms. Each diaphragm or combination of diaphragms represents a letter or word. The unit can transmit 637 symbols.

¶Goliath, a 47-year-old pet Indigo snake at the Norfolk, Neb., YMCA, holds the record as the oldest captive snake.





"Bathtub" Boat Can Be Toted on Back



To prepare the boat for portaging, lightweight oars are tied to the oarlock sockets. Then the packboard is lashed to the oars. Below, boat is light enough to be carried on the back from stream to stream. Two men can fish from the little dinghy



RESTLESS ANGLERS can explore the backwaters and wilderness areas in a new dinghy shaped like a bathtub.

The tiny one-piece boat is made of glass fiber. Weighing only 35 pounds, it can be back-packed just about anywhere. The dinghy measures about 7 feet long, 43 inches wide and 20 inches deep.

Although the dinghy is designed as a one-man craft, two 200-pound anglers can fish from it in quiet waters. The seats are sealed in place and filled with foam plastic.

The pioneering sportsman who wants to travel across country can carry the dinghy on his back. With the boat lashed to a standard packboard, he can portage at will. The lightweight spruce oars are lashed to the oarlock sockets, and the packboard in turn lashed to these. By packing a light sleeping bag, minimum tackle and food inside the boat, the fisherman can spend several days in remote country. The total weight of his gear including boat need not exceed 55 or 60 pounds.

The dinghy has been built to mount an outboard motor of 1½ to 3 horsepower.

The camper also can use the craft as a waterproof shelter. He simply inverts it and sleeps underneath, or props up the bow on a bipod made of the oars.

The dinghy also can be used as an auxiliary boat aboard a larger craft—or even as a handy bathtub in camp!

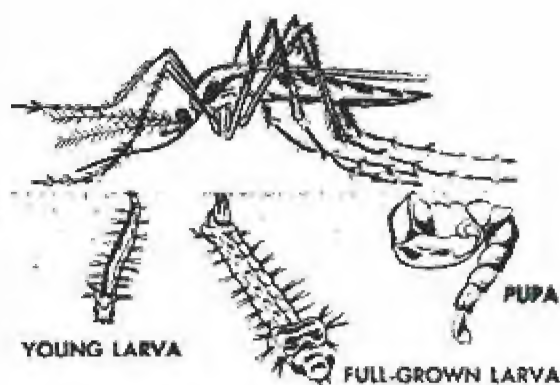
Farmers and Gardeners:

Your Insect Enemies And How to Fight Them

By Kenneth Anderson

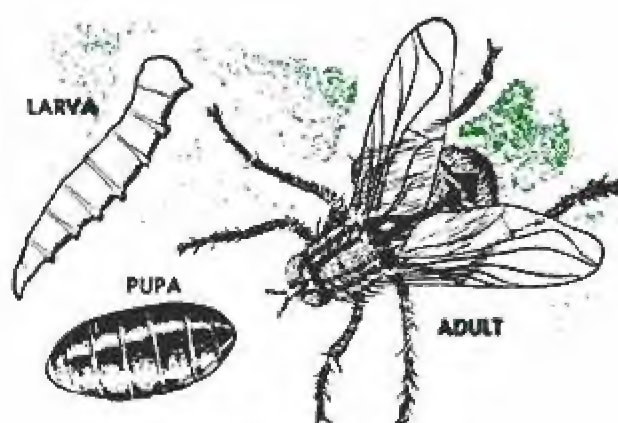
Drawings by F. David Hewitt

SCIENTISTS BELIEVE insects were swarming over the earth hundreds of millions of years before the first humans. And some predict insects will still be thriving when the last man has left this planet. In the meantime, you are surrounded by a virtually infinite number of tiny predators who will steal your food and clothing, wreck your house and furnishings or send you to the hospital with a serious disease. *Popular Mechanics* asked entomologists of the U. S. Department of Agriculture to name the 20 most destructive insects in this country. They are illustrated on these pages as they appear in various stages of their development. The egg-laying adults frequently are winged, like moths and beetles, and bear little resemblance to the wormlike larvae which hatch from the eggs. The young of other insects may be nymphs which look like the adults but are much smaller. The larva changes into an adult while in the cocoon of the pupa stage, and the life cycle continues. For the most effective use of the insecticides listed, study the manufacturer's instructions, or consult your local agricultural agent. Specific information about applying the chemical killers varies according to such factors as the stage of development of the plant or insect, the season, or even the time of day.



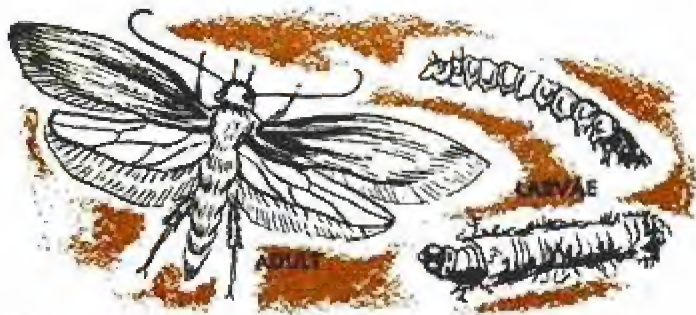
MOSQUITOES

People have been slapping at mosquitoes for centuries. The six-legged carriers of malaria, yellow fever, encephalitis and other diseases have, in effect, told man where he could build his cities and plant his crops. Some 2000 species of mosquitoes have been found. They breed in water—salt, fresh or foul—and a small amount of water will sustain a big swarm. DDT is recommended, but dieldrin or toxaphene is needed in some cases



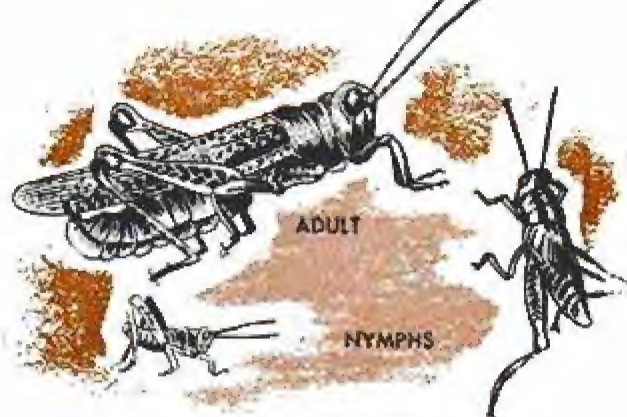
HOUSE FLIES

Much more than a simple nuisance, the house fly may carry germs of typhoid fever, dysentery, yaws or tuberculosis. Flies cannot exist without decaying organic matter in which to breed but can travel up to 13 miles to find it. And the number of offspring one female can produce in a season is the figure 191, followed by 18 zeros. Some flies, like some mosquitoes, are DDT-resistant. Recommended killers: chlordane, lindane, toxaphene, methoxychlor



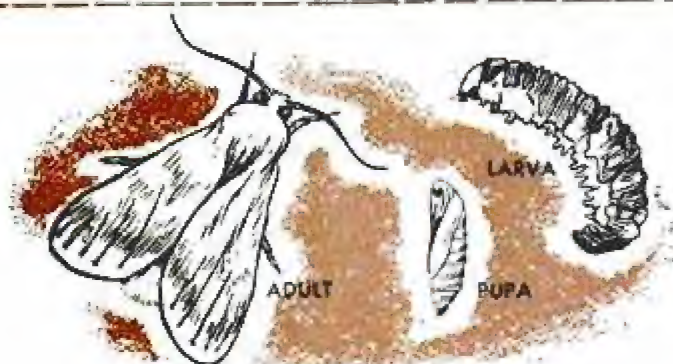
CLOTHES MOTHS

Fabric pests, like the webbing clothes moth, cause up to a half-billion dollars damage each year. A full-grown clothes-moth larva is about one half inch long, has a white body and dark head. The moth is yellowish or buff, with a wingspread of a half inch. Adult clothes moths do not flit about lights, but hide in dark areas. The larvae eat articles that contain wool, mohair, down, hair or feathers. Control chemicals: DDT, EQ-53 and chlordane



GRASSHOPPERS

Members of a large order including legendary Old World locusts and Mormon crickets, grasshoppers have been known to destroy 75 percent of the farm crops in an area of 17,000 square miles. Despite extensive control measures, they cause an estimated \$18,000,000 damage yearly. Most destructive U.S. species include differential, migratory red-legged and clear-winged grasshoppers. These insects can be killed by using aldrin, chlordane or toxaphene



PINK BOLLWORM

From India, where it was first found, the pink bollworm has spread to the world's major cotton producing areas. The larva relishes cottonseed kernels and may eat all the seed kernels in a boll. But it ruins the lint as it passes through. Even if the boll is only partly damaged, the cut and stained fibers lower the grade of the cotton and much of the cottonseed oil is lost. Mature larva has pink stripes. The recommended poisons are DDT and Guthion



BOLL WEEVIL

About 10 percent of the cotton crop is destroyed each year by this insect which slipped across the Rio Grande River from Mexico in the 1890s. The color of the boll weevil varies from light yellow to gray or black. Its size is determined by the amount of food it obtains in the larval stage. The weevil destroys the cotton buds or the lint in the boll. Boll-weevil poisons include: Endrin, toxaphene, aldrin, dieldrin, Guthion, Malathion and heptachlor



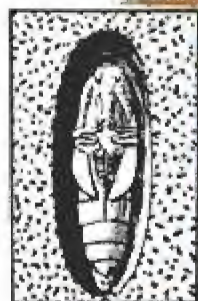
LEAFHOPPERS

As flies spread diseases among humans, leafhoppers carry plant diseases. Leafhoppers transmit viruses which destroy peaches, cranberries, beans, grapes, potatoes and sugar beets. The potato leafhopper also attacks alfalfa and red clover, damaging up to one fourth of these crops in the Eastern states. Besides spreading diseases, leafhoppers damage plants by sucking juices from the leaves. DDT, methoxychlor, Malathion are recommended insecticides

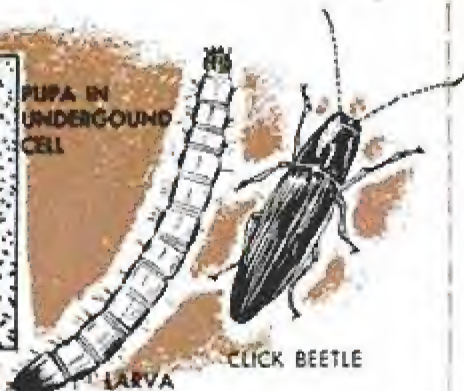


TERMITES

These insects are so destructive in some regions that railroads use metal ties. Termites can eat wood because of tiny organisms in their intestines that help digest cellulose. Subterranean termites attack wooden parts of buildings from nests in the soil, where they get the water necessary for their existence. Recommended soil poisons to be used around building foundations include DDT, chlordane, dieldrin, sodium arsenite, and lindane



PUPA IN
UNDERGROUND
CELL

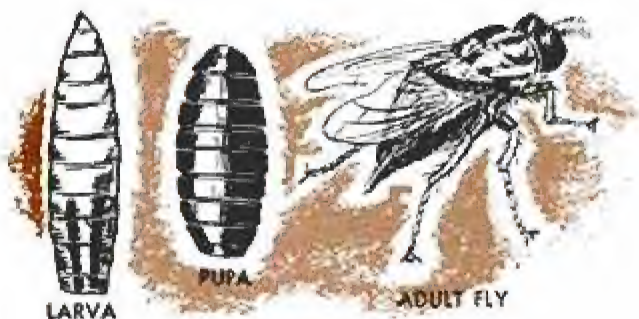


LARVA

CLICK BEETLE

WIREWORMS

Ranging in color from white to orange, with dark heads and tails, wireworms are the larvae of click beetles. They attack any vegetable or field crop, from tomatoes to potatoes, but feed only on the underground parts of the plants. The larvae bore holes in the larger stems, roots and tubers and cut off smaller underground stems. Wireworms in Western states are killed by DDT, but in Eastern states, chlordane is the recommended insecticide.



LARVA

PUPA

ADULT FLY

SCREW-WORMS

Cannibal-like screw-worms feast on the flesh of living warm-blooded animals. The adult fly, which is bluish-green in color and three times the size of a house fly, lays its eggs in cuts and scratches on livestock. If the wounds are not treated, the screw-worms eventually will kill the animal. This insect causes about \$20,000,000 damage each year. Scientists are using atomic radiation to sterilize the adult screw-worm flies so their eggs won't hatch.



LARVA

ADULT

SPRUCE BUDWORM

Spruce-budworm larvae tunnel in old needles of spruce and fir trees, then bore into opening buds. In one outbreak in Canada, Maine and Minnesota, budworms destroyed 225 million cords of pulpwood. During a recent rampage in Oregon, they defoliated three million acres of Douglas fir. The adult moth is grayish-brown and the larva changes from yellowish-green to reddish-brown as it becomes full-grown. Foresters apply DDT to feeding budworms.

CONFUSED FLOUR BEETLE



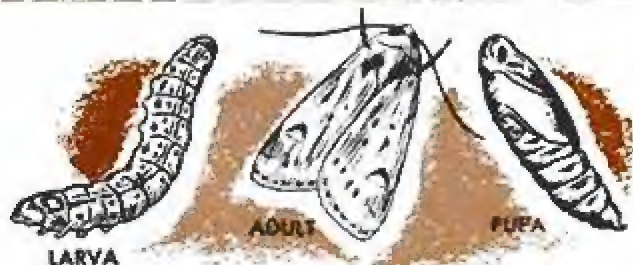
INDIAN-MEAL MOTH

RICE WEEVIL

GRAIN BEETLE

STORED-GRAIN PESTS

Annual worldwide losses to stored-grain insects are measured in millions of tons. The weevils, beetles and moths that you may find in your pantry are the same kind that infest grain elevators. Many of the pests are so small that their presence in stored grain is not detected until they have multiplied several times. Cribbs and granaries can be treated with DDT, methoxychlor or pyrethrin powders. Kitchen cabinets should be sprayed with DDT.



LARVA

ADULT

PUPA

CORN EARWORM

Most destructive of ear-corn insects, the green or brown corn earworm causes more than \$50,000,000 damage each year to field and sweet corn. It also attacks cotton, tomatoes, alfalfa, beans, peanuts and tobacco. The moth lays eggs on the corn silks and the larvae follow the silks down into the ear after they hatch. The full-grown larvae leave the ears and go into the soil where they enter the pupal stage. Poisons include DDT and methoxychlor.



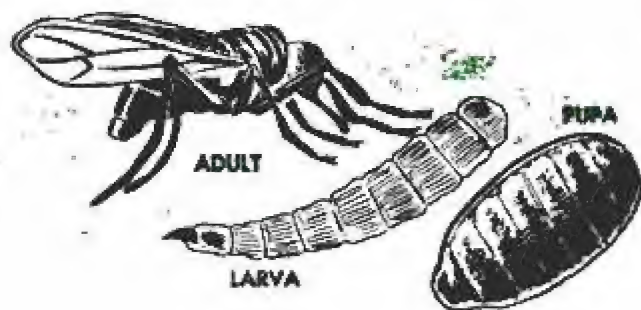
ADULT

LARVA

PUPA

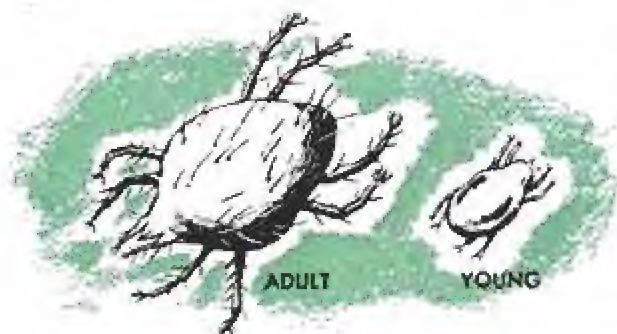
ARMY WORMS

Offspring of night-flying moths, army worms get their name from the fact that vast hordes of the larvae sometimes go on warlike rampages which wipe out entire fields of grass or grain. They also attack sweet corn or cabbage, and the fall army worm destroys peanuts, other legumes. The larva has a striped body and may be 1½ inches long. Recommended insecticides are DDT, TDE, toxaphene, chlordane, aldrin and dieldrin applied by spraying.



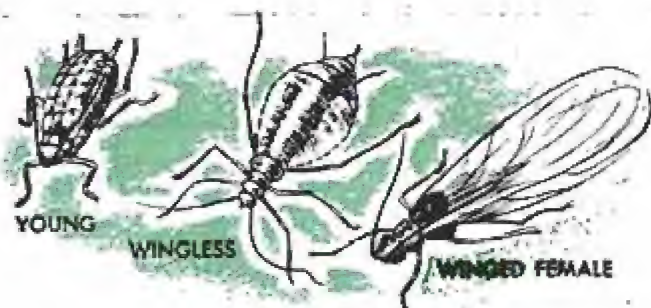
LIVESTOCK FLIES

Horse flies, stable flies and horn flies cause annual losses of \$245,000,000 by tormenting livestock. Milk cows give less milk and beef cattle produce less beef when irritated by these pests. Horn flies and horse flies are bloodsucking insects like the black flies that kill animals in swarm attacks. Cattle protected by DDT gain 50 pounds per month more than untreated cattle. Other controls include pyrethrins, thanite, Malathion, lethane, methoxychlor



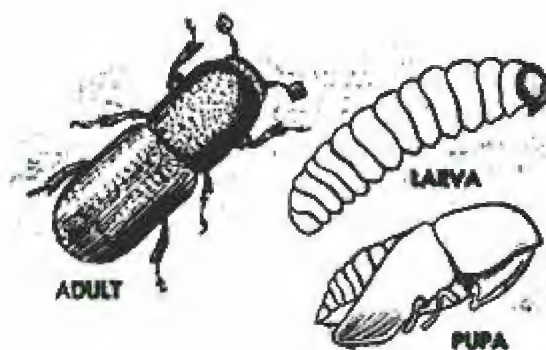
MITES

Not true insects, mites are tiny eight-legged sucking pests that attack people, plants and animals. Chiggers are mites that annoy humans and the little "red spiders" that stunt the growth of plants also are mites. Some members of the family cause mange in farm and wild animals. Others infest poultry, reducing egg production and weight of broilers. Most mites are controlled by sulphur, parathion, demeton, Malathion, Aramite or toxaphene



APHIDS

Also known as plant lice, aphids attack almost every kind of plant. They cut into plant tissues and suck the juices. Aphids also spread plant diseases. The green peach aphid alone transmits 50 kinds of plant viruses. Adults produce both winged and wingless offspring, with winged, migratory types increasing in numbers as colonies become crowded. Recommended insecticides include DDT, TEPP, Malathion, demeton, rotenone and nicotine sulfate



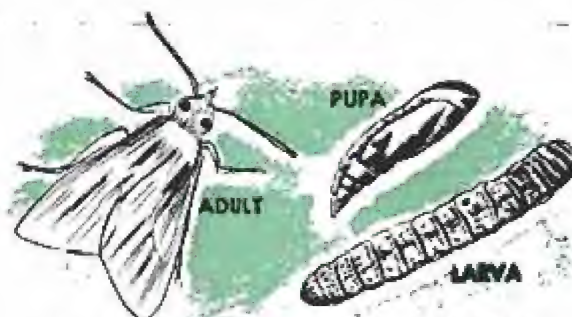
BARK BEETLES

One outbreak of bark beetles in the Black Hills wiped out a billion board feet of pine. In Colorado, a swarm of bark beetles once killed 400,000 trees in a mass attack. They breed in timber damaged by fire or storm, then attack healthy trees nearby. The beetles bore through the bark and construct tunnels and egg galleries in the soft wood tissue. Bark beetles are killed by chlordane, ethylene dichloride and DDT applied to the beetle-infested area



CATTLE GRUBS

Cattle grubs, the larvae of heel flies, hatch from eggs fastened to the hair of cattle. The grub bores into the skin, tunnels through the tissues of the animal for months, then cuts another hole in the hide to leave the host and enter the pupa stage. Both meat and hides of grub-infested cattle bring a lower price when the animals go to market. The total annual loss is \$100,000,000. Rotenone and Dow E7-57 are recommended insecticides for this pest



EUROPEAN CORN BORER

Since its ancestors arrived in America in a shipment of broomcorn 40 years ago, the European corn borer has spread to the Gulf Coast and the Rocky Mountains. One of the most injurious enemies of field and sweet corn, it caused nearly \$350,000,000 damage in one year alone. The pink or brown larvae tunnel through all parts of the corn plant, from the brace roots to the tassels. Borer is killed by DDT, ryania, heptachlor, toxaphene



"Fanning" up the river is a lot easier than trying to paddle a canoe against a swift current

"Air Canoe" for Fishing

By Herbert P. Henshaw



HERE'S THE IDEAL RIG for the angler who likes to fish the foothill rivers and other waters that move too fast to buck with paddle or oar.

The answer in such waters is a canoe driven by an air-drive motor. Anyone who has tried an ordinary boat and motor knows the difficulties encountered in swift, shallow waters. The rocks that shelter the fish lie just beneath the surface, waiting in ambush to bend propellers and ruin shear pins. You can float down such streams in a canoe, but then you are faced with the problem of driving a car to the take-out spot for the haul back to camp.

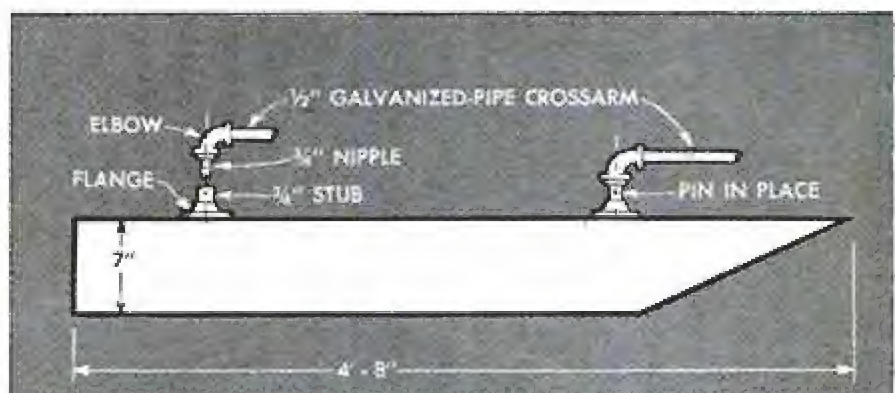
These difficulties can be avoided with an air-driven canoe. Such a craft will skim smoothly upstream and actually slide over a six or eight-inch ledge without difficulty. In still water the canoe will make about eight miles per hour carrying two men and their gear.

A good way to stabilize a canoe for such rough-

water fishing is to add pontoons or outriggers to the craft. The pontoons shown in the photos and the diagram were made from seven-inch aluminum irrigation pipe, but any similar pontoons will serve. The crossarms are galvanized pipe, and the entire assembly can be removed in two minutes. The additional weight is less than 30 pounds.

In addition to the pontoons and air-drive motor, the rig requires a motor mount which clamps to the canoe. The result is a craft with the maneuverability of a canoe and the stability of a flat-bottom scow.

Pontoons are made of aluminum irrigation pipe, held in place by crossarms



Those Wonderful "Thinking" Machines...



PERFORM
14,000 OPERATIONS
PER SECOND



... TRACK SPUTNIKS

By James Joseph



... MAKE AIRLINE
RESERVATIONS



... MAKE OUT BILLS

IF YOU WERE TUNED to television on election eve 1956, you witnessed a rebirth of scientific faith which was sadly lacking when, on the same evening in 1952 UNIVAC—Remington Rand's remarkable electronic brain—embarrassed its creators by predicting an Eisenhower landslide.

This time UNIVAC's handlers calmly accepted the brain's forecast of an Ike victory as mathematical gospel. Yet four years before they had hedged, stammered and at one point confided to viewers that their wizard machine was apparently suffering a nervous breakdown.

As the 1952 returns proved, UNIVAC had been in robust health all along. The "error" was human. For most people—UNIVAC's designers included—were still skeptical that cathode-ray tubes, punched cards, magnetic drums and a maze of wiring could outsmart the best of human brains. We now know, of course, that they can. And in the process, these wonderful *thinking* machines—as some whimsically call them—are intruding more and more into our daily lives.

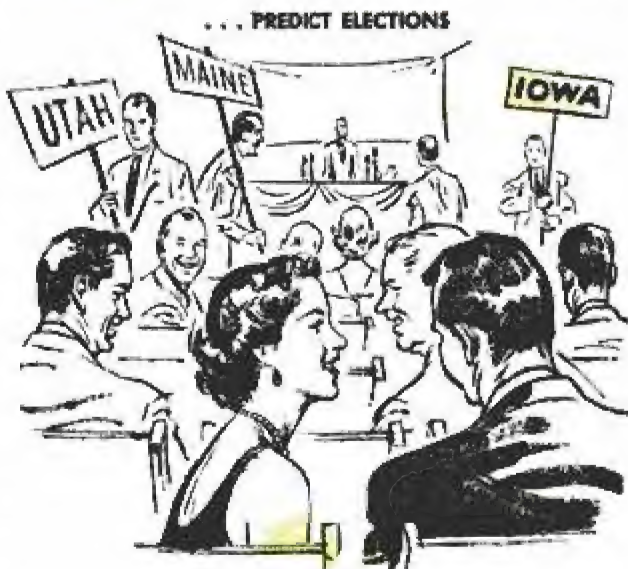
If you work for a large company, chances are your weekly paycheck comes from a transistor-hearted computer. Breathlessly fast, the machine figures your overtime pay, withholds your taxes, deducts for Social Security, unerringly remembers that you're buying a bond on the Payroll Savings Plan—and even prints the check your wife cashes at the grocer's.

You can thank computers, too, for that recent pay increase that put your income in line with rising living costs. Monthly, Labor Department computers sift through a mountain of statistics, keeping the government's Cost of Living Index as fresh as today's bread.

If you're a Detroit, your electric bill—like those of 1.2 million of your neighbors—is disgorged from an International Business Machine "brain" which scans your meter readings, figures the charges and runs off ready-for-mailing bills.



... HELP ASTRONOMERS



... ISSUE PAYCHECKS



... NAME NEW DRUGS

... FORECAST WEATHER



... SOLVE PROBLEMS FOR ICBM ENGINEERS



Electronic typing calculator with a memory can be operated by a typist after only few minutes' study

Computers refund a whopping \$2,000,-000,000-plus in dividends annually to ex-GIs who hold National Service Life Insurance. They forecast tomorrow's weather today, and with accuracy unheard of a few years ago. They pinpoint economic soft spots long before they can become local depressions. They reserve your seat on an airliner, balance your bank account, settle the claim you have against the insurance company—yes, computers are even authoring books. Brooklyn's Chas. Pfizer & Co., a pharmaceutical manufacturer, recently hired an IBM computer to invent medical-sounding, easy-to-pronounce names for the many new drugs it has under development. The IBM machine, which never once worried about writer's cramp, took less than a week to come up

Operator checks IBM desk-side machine that solves many problems now handled by big computers. Typewriter gives answers



with 42,000 potential trade names, all neatly compiled in a 198-page book. "Byulamy-cin" was one of them. And who knows, it may someday save your life!

Of the several thousand mechanical brains—big and small—currently at work in the United States, probably half are gainfully employed in industry, and most are doing their thinking in behalf of national defense.

Ramo-Wooldridge Corporation which, as special technical consultant to the Air Research and Development Command, rides herd on our huge intercontinental-ballistic-missile program, no longer spends months building working models of every new missile and component dreamed up by designers. Instead, the "war bird" is reduced to a complex of mathematical equations which simulate the finished design. It is then "test flown" on a giant computer—its in-flight performance as accurately calculated as if a test missile had actually been launched. Continent-spanning ICBMs are already in production, thanks to electronic brainwork which has shaved years off development.

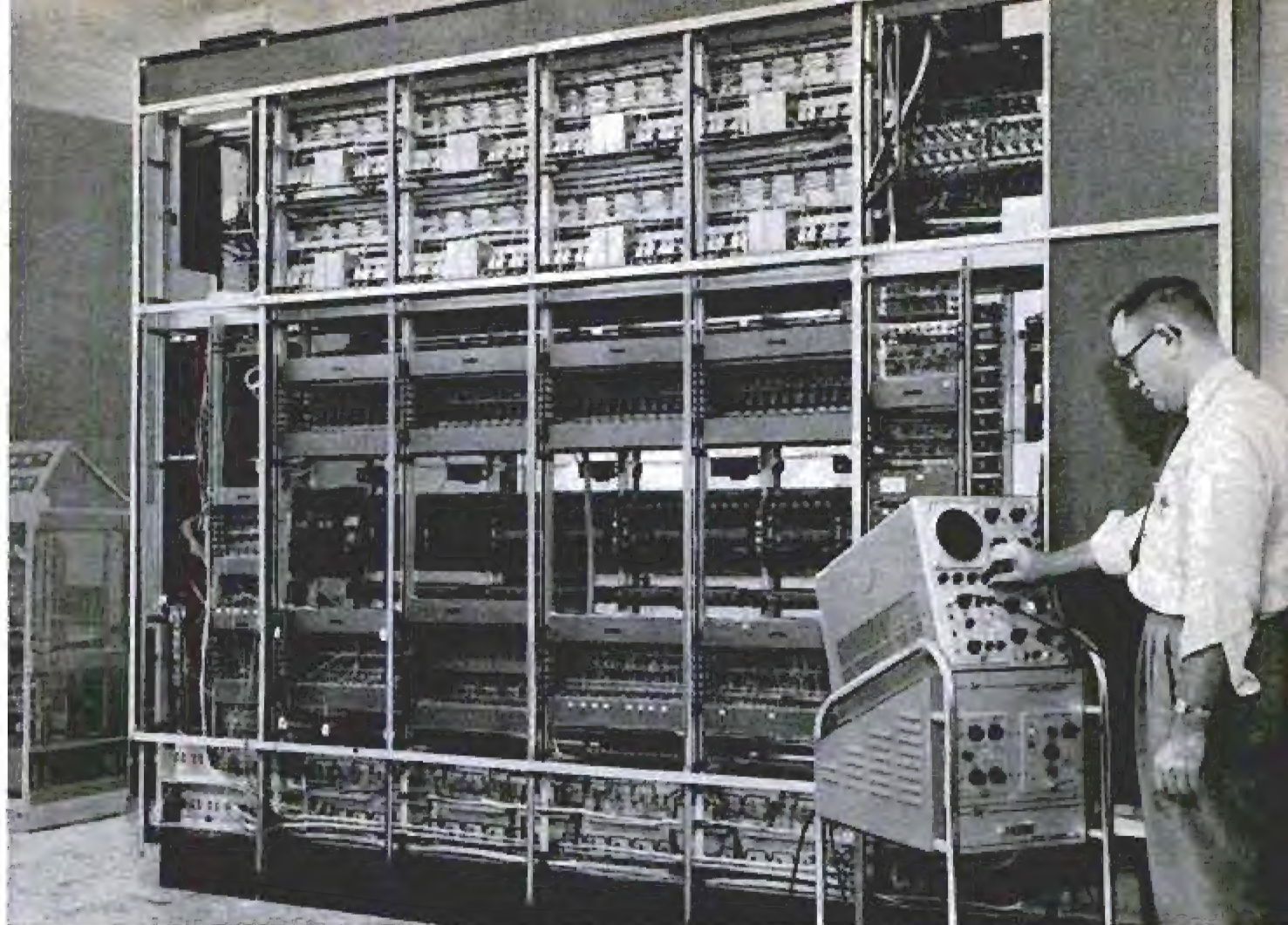
Lockheed, its new turbopropelled Electra transport not even scheduled for delivery until later this year, has already set computers to writing manufacturing orders for every part that will go into the plane.

Says Norman J. Ream, Lockheed's director of systems planning: "We know on what day each Electra will be at the line position where we mate wings to fuselage, and at every other line position, even though initial assembly is months away."

At Northrop Aircraft, machine tools which supply its F-89 all-weather fighter and Snark missile assembly lines are assigned their jobs by UNIVAC. The "brain" writes all shop orders telling hundreds of machines what work they will be doing on a certain day and at a specific hour six months hence. Such advanced planning, totally impossible before "brains" became tools of manufacturing, squeezes maximum efficiency from every Northrop machine.

UNIVAC, in the hands of top astronomers, has both located Jupiter's lost eighth moon and written a terrifying biography of the sun which predicts solar destruction as the earth's only source of warmth nears its 10 billionth birthday.

In the case of the eighth moon, astronomers at the University of Cincinnati Observatory turned astrophysical sleuths. Lost was Jupiter's tiny, far-spatial eighth moon, whose path is almost as



Michigan State University photo

Here's an electronic "brain" 10 feet tall that can perform 600,000 additions or subtractions a minute

circuitous and uncertain as a garden snail's. Jupiter VIII hadn't been observed since 1941. Its last orbital whereabouts had been laboriously plotted in 1938 by Dr. H. R. J. Grosch. Now, when University of Cincinnati scientists wanted to train telescopes on the erratic moon, they didn't know where to look. Finding the faint satellite seemed all but impossible.

UNIVAC took over the sleuthing. Beginning where Dr. Grosch had left off his computations, the brain took just 20 minutes to compute the satellite's orbit up to the

year 1980. Dr. Grosch's hand calculations had taken 10 to 15 minutes to advance Jupiter VIII's orbit through one 10-day cycle. UNIVAC breezed through a 10-day orbital prediction in $\frac{1}{2}$ second. And when Dr. S. B. Nicholson, with UNIVAC calculations in hand, put Mount Wilson's 100-inch telescope on the search he picked up the satellite's dim image within one minute of the arc predicted by the brain.

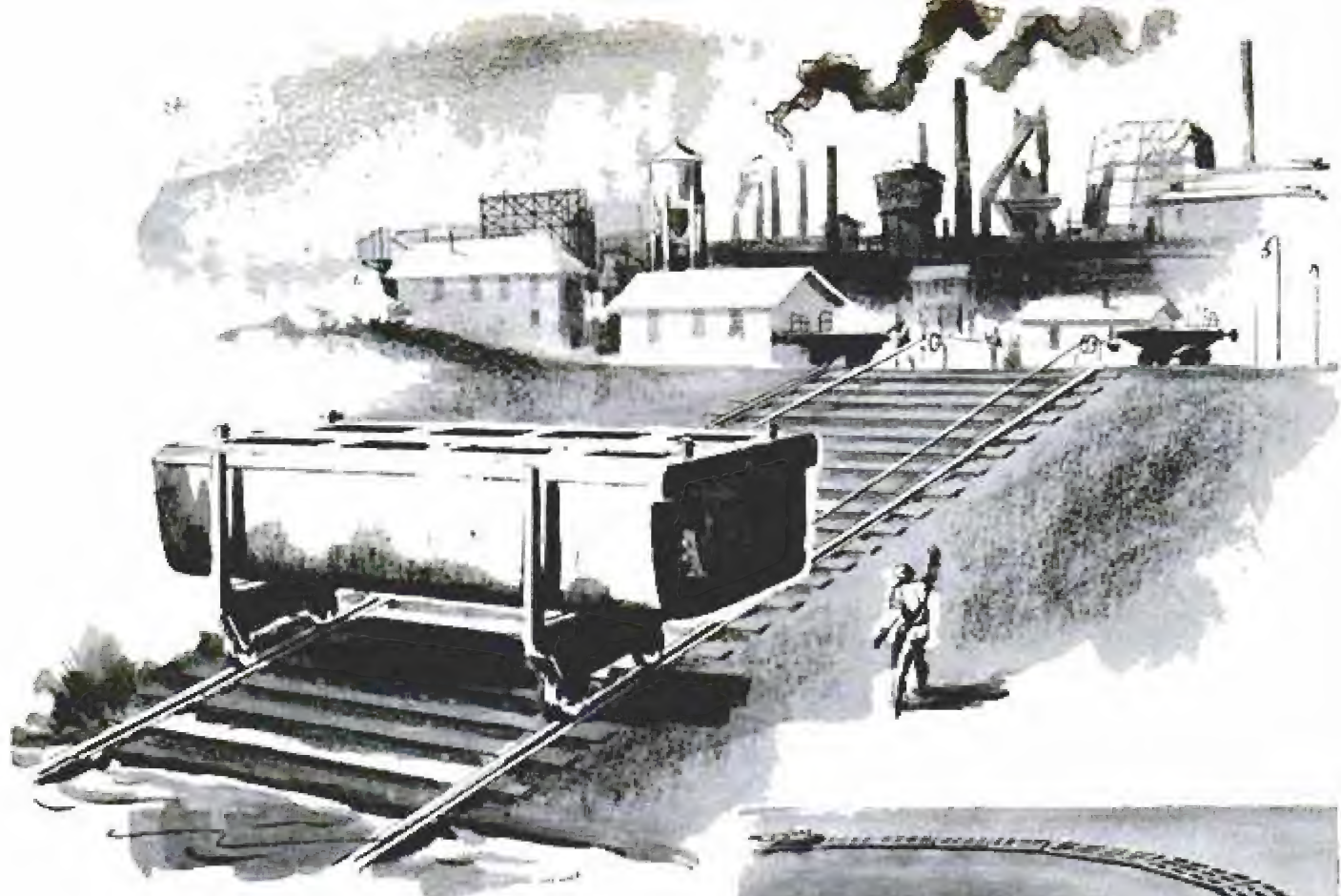
The sun's biography—the story of its nebulous birth, its fiery youth and bloated

(Continued to page 216)

Dr. F. L. Whipple with machine at M.I.T. which has been fed information to determine satellite orbit

High-speed printer of UNIVAC system is capable of printing 600 lines a minute. It handles huge output





Barge or Rail Car For Water or Land

GERMAN GONDOLAS that will float as river barges or roll on standard railroad bogies are expected to reduce the cost of transporting bulk materials by as much as 50 percent. The multiple-use carrier being developed by a firm in Dortmund will save time and expense of loading and unloading bulk cargoes at river ports. The bulk carriers also could be adapted to a truck trailer frame and pulled over the highways. Each unit has a carrying capacity of approximately 51 tons. After reaching a harbor or river port in a chain of barges, the gondolas can be lifted out of the water by maneuvering them onto a pair of wheeled

Added advantage of the units is ability to dump on either side of track. Carriers tilt to 60 degrees



Towboats move a raft of the bulk carriers to a port where the barges will be mounted on railway bogies

supporting frames. The supporting frames run on a wide-gauge underwater spur track and are controlled by a winch. At the top of the embankment, above the waterway, the wide-gauge rail spur intersects standard railway tracks. There, a double-axle railroad bogie can be positioned under end of the gondola. The carriers conform to German Federal Railway specifications.

Carriers are designed to meet specifications of the German Federal Railway when mounted on rail trucks





Message From Penguin Egg

What is the temperature inside a penguin egg? Science may soon know, thanks to a radio thermometer that fits inside the egg. Its messages may reveal how an egg can hatch after being left on the ice for long periods.

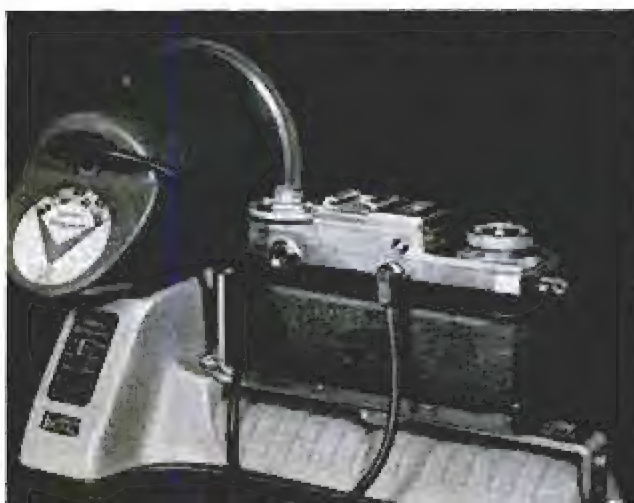


Welding in Plastic Tent

Within a plastic bubble filled with inert argon gas, titanium aircraft-engine parts are welded. If titanium is welded in ordinary air, impurities occur at the joint.

Rechargeable Flash Unit

Transistors and rechargeable nickel-cadmium batteries power a new electronic flash attachment for cameras. It recharges from a 110-volt a.c. outlet.




150-Foot Aerial Ladder Extends in 30 Seconds

Green Bay, Wis., firemen claim the longest aerial ladder in the United States. Extending to a length of 150 feet, it can reach the highest building in Green Bay and will hold 720 pounds. A power takeoff device extends the ladder to full length in 30 seconds. The ladder measures 32 feet when folded on the truck.

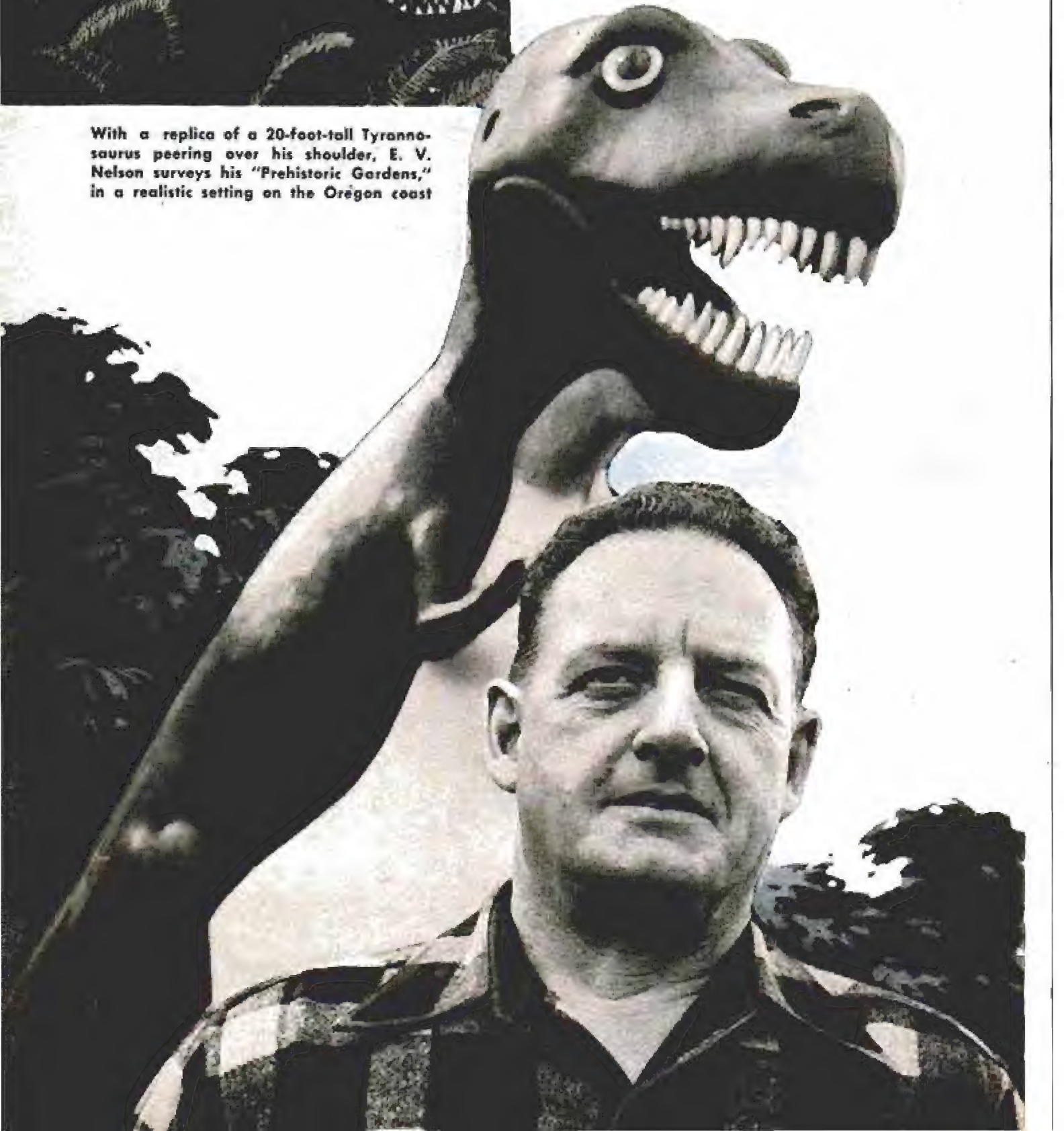
Two-Volt Booster Battery

Used only in starting, a two-volt wet-cell booster battery gives the extra power needed to start stubborn auto engines. It is kept charged by the main battery.





Turn back the clock about 100 million years and you might find one of these savage reptiles in your back yard. They're life-size replicas reproduced in cement and painted in natural colors, according to the best scientific knowledge about dinosaurs



With a replica of a 20-foot-tall Tyrannosaurus peering over his shoulder, E. V. Nelson surveys his "Prehistoric Gardens," in a realistic setting on the Oregon coast



Sculptor and assistant put the finishing touches on a replica of a Stegosaurus, a 10-ton plated dinosaur

By Ken Metzler

IN NATURE'S EXPERIMENTS with animal life, she has never engineered more fantastic, bizarre creations than the monstrous dinosaurs that ruled the earth in the Mesozoic era, long before the dawn of man. Indeed, these immense beasts were some of the most singular examples of all brawn and little brain ever to exist.

The plated Stegosaurus, for example, weighed eight to ten tons, yet his brain was no larger than a walnut. Tyrannosaurus, the giant "tyrant lizard" that was one of nature's final entries in the dinosaur chapter, was 20 feet tall and 50 feet long. His head was all mouth—so huge and savage that he could have swallowed a man in a single gulp—if man had lived in his era.

An Oregonian named E. V. (Ernie) Nelson developed a compelling interest in such monsters as these when he began reading about them as a schoolboy. He maintained his interest through adulthood and even though his job was metalwork, his heart was in paleontology.

But it wasn't until he took an automobile trip that his lifelong passion for monsters

reached a climax. Driving past billboards announcing various roadside tourist attractions, he was struck by an idea—he would build a tourist attraction himself. It would feature life-size sculptured replicas of the dinosaurs. And since his knowledge of paleontology would not permit otherwise, he would construct the replicas as accurately as it was possible to make them.

After months of searching, Nelson finally found the perfect background for his monsters—a 70-acre tract of rain forest flanking the coast highway in the southwest corner of Oregon. Although this area was undoubtedly under water during the era of dinosaurs, its present flora closely resembles that which existed at the time.

Naming his project the "Prehistoric Gardens," Nelson embarked on the task of building monsters. Working directly from photographs and drawings of skeletal reconstructions displayed at the Museum of Natural History in New York, he carefully drew scale plans for each of his creations.

While nature provided its dinosaurs with skeletons of bone, Nelson built his with



Pteranodon, with 27-foot wingspan, is supported by steel A-frames embedded in a concrete counterweight

skeletons of wood or steel. Tyrannosaurus, for example, is supported in its upright stance by three main beams of heavy timber. One angles up through the tail and forms the backbone; the others extend vertically through the legs.

With the skeleton complete, Nelson called in Walter Pritchard, a former college professor of sculpture, to clothe the animal in cement. Pritchard added the cement to a wire-mesh base, then sculptured it to match drawings of the original monster.

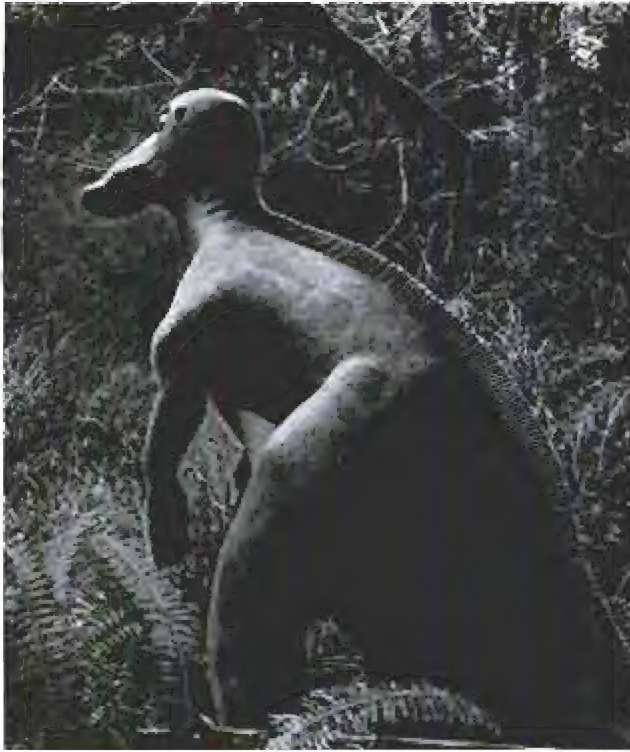
He started with the four-foot head which weighed 700 pounds and had to be hoisted into place by crane. It was then bolted onto the timber that supports the neck.

The Tyrannosaurus replica—nicknamed "Tiny"—soon appeared in finished form, as did the other exhibits. All were painted the colors of the original monsters, insofar as their coloring could be determined.

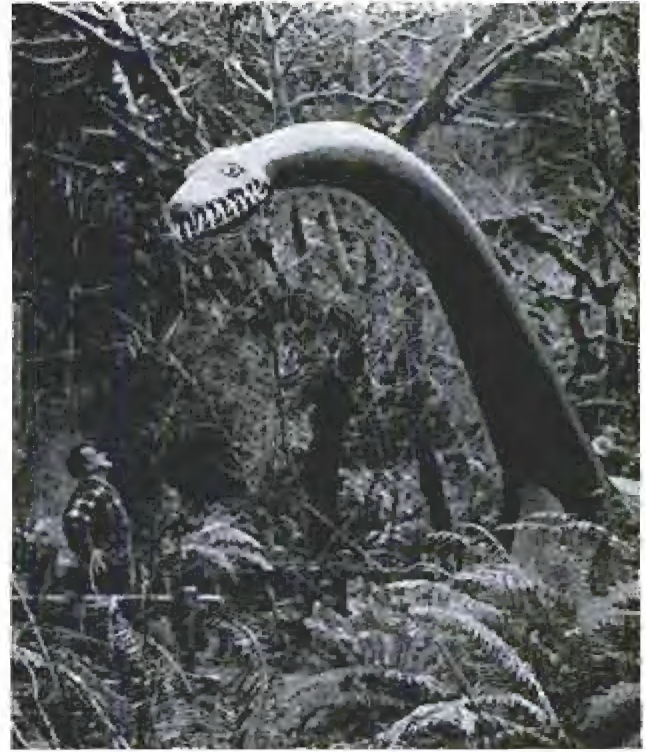
Among the displays, Pteranodon, a flying reptile with a wingspan of 27 feet, is one of Nelson's favorites. It is shown on a rock,

Well-armored adult Triceratops had three spiny horns on his face, and a great bony shield protected his neck and shoulders





Duck-billed Trachodon dinosaur weighed six to eight tons and had 2000 peglike teeth in its mouth



Elasmosaurus, a marine reptile, had large teeth that acted as a fish trap. He swallowed fish whole

wings spread in an attitude of take-off.

Nelson delights in telling the story of a woman visitor who once asked what kept this winged monster from falling off its precarious perch.

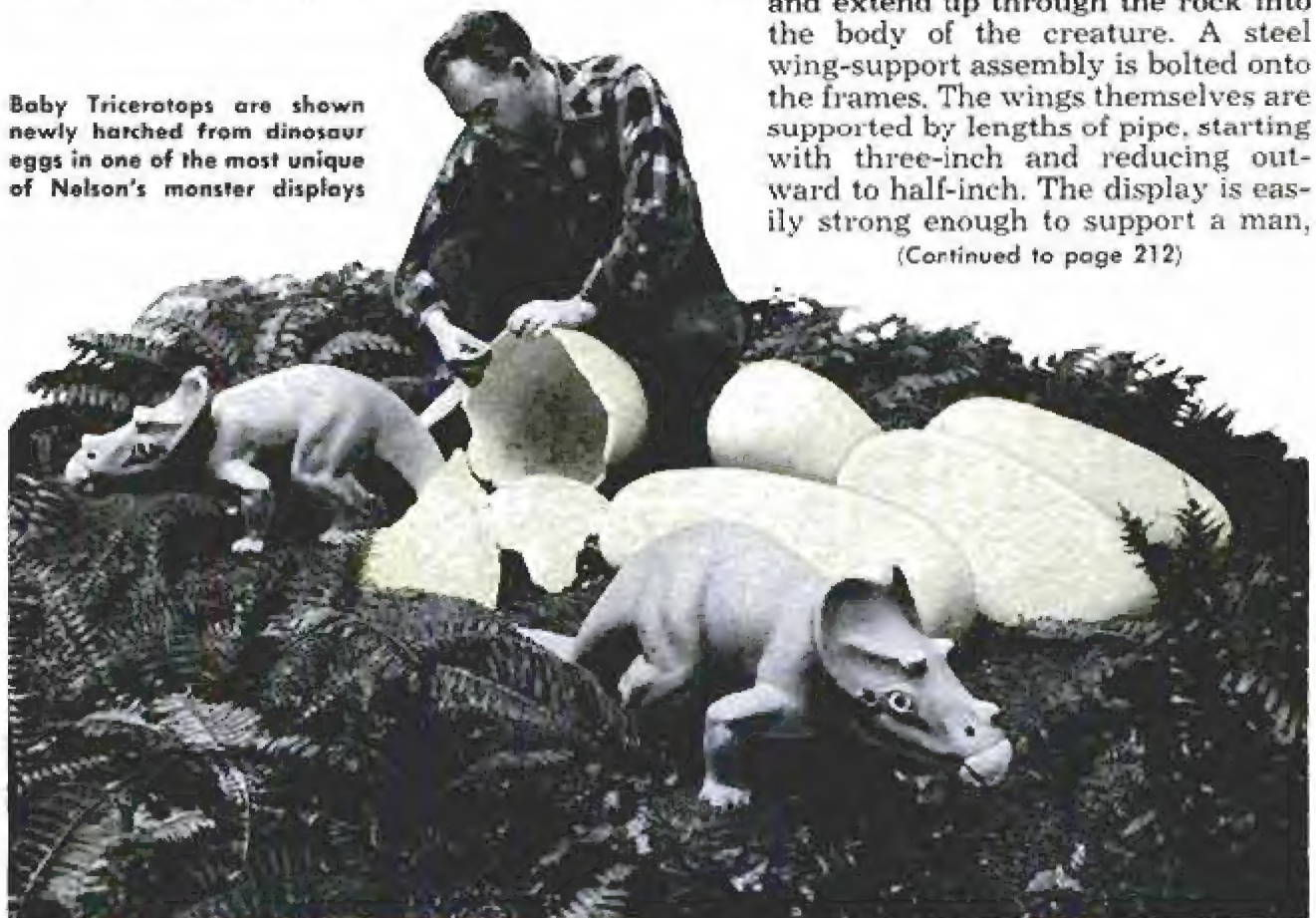
Feeling in something of a mischievous mood, Nelson could not resist quipping, "Why, his wings support him, of course."

The woman accepted this answer for a few minutes. Then, after re-examining the display, she indignantly exclaimed, "Say, are you trying to pull my leg?"

Actually, the support of this soaring reptile in its not-quite-airborne position required a bit of engineering. Steel A-frames are embedded in a concrete counterweight and extend up through the rock into the body of the creature. A steel wing-support assembly is bolted onto the frames. The wings themselves are supported by lengths of pipe, starting with three-inch and reducing outward to half-inch. The display is easily strong enough to support a man,

(Continued to page 212)

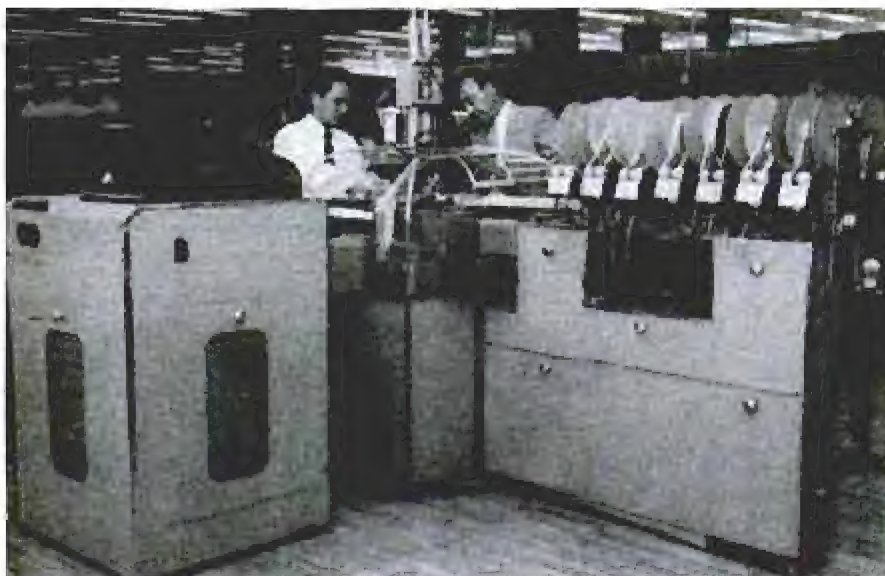
Baby Triceratops are shown newly hatched from dinosaur eggs in one of the most unique of Nelson's monster displays





Small Ford Bus Wears Three Flags

Talents of three nations combine to build the Mexican Ford FK-1000, an eight-passenger bus. Assembled in Mexico, the parts are fabricated at the Ford Motor Company plant in Germany. Control of the operation is at the main Ford office in the United States. The vehicle's four-cylinder water-cooled engine is mounted between the driver and front-seat passenger. Displacement is 93.5 cubic inches and horsepower is 60.



Assembly Machine Is Automatic

Electronic layouts are automatically assembled by a new IBM machine. The device takes diodes, resistors and other components from long reels and fastens them to printed circuit panels. It assembles electronic units 10 times faster than is possible by manual methods. The machine receives instructions from cards and resets itself when the layout is changed.



Underwater Coil Locates Metal

Outboard motors and other metallic objects can be located in water up to 300 feet deep with a waterproof search coil. The electronic device, designed for use from boats, is dropped overboard and kept near the bottom as the boat moves forward. When the search coil approaches a metal object, it emits a sound through the headphones. The sound increases in pitch and volume as the search coil moves closer to the object. The device operates on dry batteries.

Hi-Fi without frills. The performance of this low-cost amplifier should please even a discriminate music lover.

Radio Television Electronics



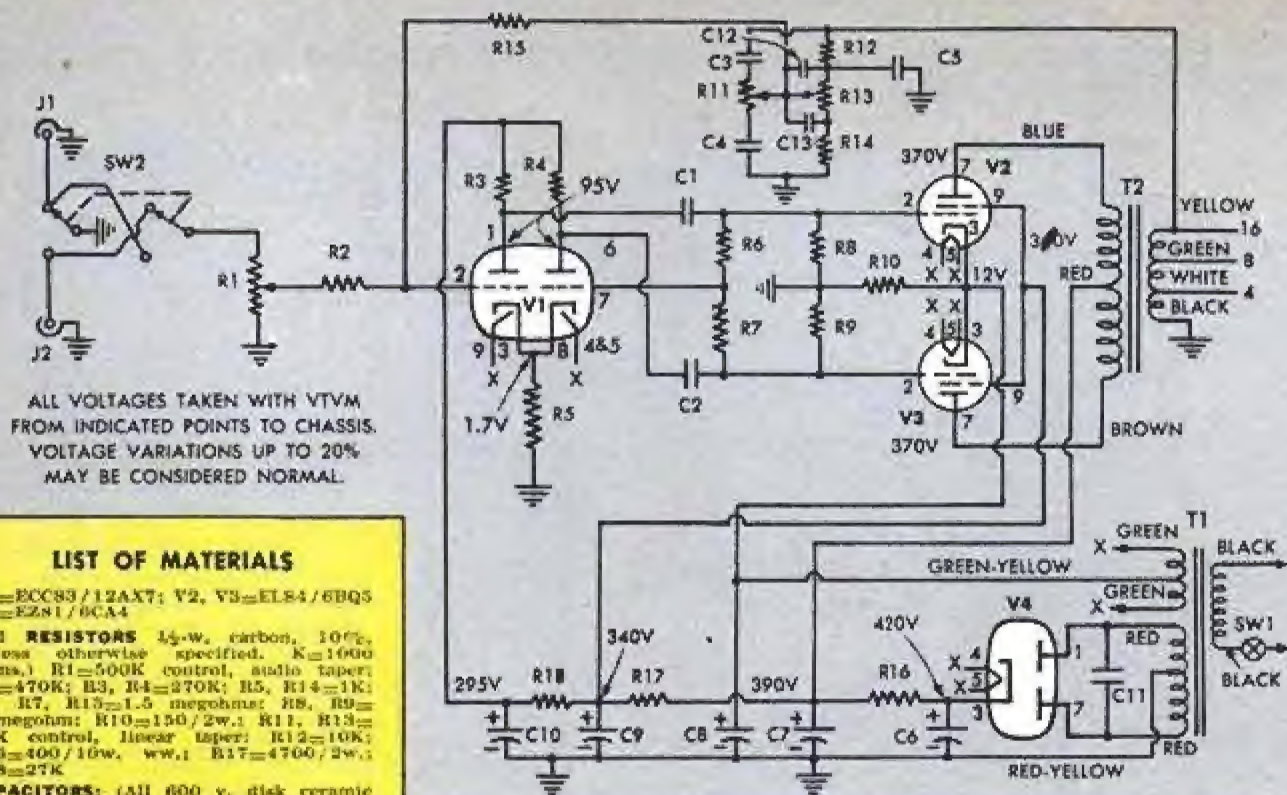
Practical Amplifier for Low-Cost Hi-Fi

By Daniel F. Mitchell, W9OFB

REMEMBER the bygone days when all you had to do for an evening of musical entertainment was to turn on the phonograph, adjust the volume and settle down in your favorite easy chair? Of course, the music sounded a bit thin—there was practically no bass and very little treble—but then, you didn't have to worry about turntable rumble, and record noise was not particularly troublesome. If you sat close to the speaker, you didn't need to turn up the volume high enough to make the loud orchestral passages sound like the rattling of cutlery, and if the low passages were masked by the inherent hum of the amplifier, at least there was no trouble with uncooperative neighbors whose taste in music didn't happen to coincide with your own. By mentally supplying the missing high and low tones it was almost possible to liken the resulting sound to something you may have heard at Orchestra Hall.

The advent of high fidelity and its ever-increasing acceptance by the music-loving public has changed all this. Today, full-

frequency records and high-fidelity FM broadcasts provide excellent sources of high-quality music. Reproducing equipment capable of faithfully translating the recorded or transmitted signals into corresponding sound waves is readily available. But, as the art of high-fidelity reproduction improved, so did the complications. The modern hi-fi amplifier is more like the control console of yesteryear's broadcast studio than a piece of home equipment. There are controls to compensate for certain characteristics, and other controls to compensate for the compensation. All of them, of course, have specific functions and tend to provide the technically informed "perfectionist" with the means for approaching the "unattainable ultimate" in music reproduction. To the more casual music lover, however, they represent a profusion of confusion and they are often left in compromise positions which may not provide perfection but eliminates the need for readjustment with each consecutive selection.



LIST OF MATERIALS

V1=6X4/12AX7; V2, V3=6X4/6BQ5
V4=6X4/6CA4

(ALL RESISTORS 1/2-w. carbon, 10%, unless otherwise specified. K=1000 ohms.) R1=500K control, audio taper; R2=470K; R3, R4=370K; R5, R14=1K; R6, R7, R15=1.5 megohms; R8, R9=1 megohm; R10=150/2w.; R11, R13=50K control, linear taper; R12=10K; R16=400/10w. ww.; R17=4700/2w.; R18=27K

CAPACITORS: (All 600 v. disk ceramic unless otherwise specified) C1, C2, C12=.02 mfd.; C3=.01 mfd.; C4=.05 mfd./200 v. paper; C5=.0002 mfd.; C6, C7, C8=40-40-20 mfd./450-450-25 v. electrolytic; C9, C10=40-80 mfd./350 v. electrolytic; C11=.015 mfd. 1000 V. ceramic; C13=.1 mfd. paper

T1=Power transf.—700VCT @ 90ma., 6.3VCT @ 3.5 a.; T2=Output transf.—10,000 ohms CT to 4, 8 and 16 ohms, 18 watt rating, Allied Radio Corp. part No. 62G058

J1, J2=phono input jacks; SW1=spst slide or toggle switch; SW2=dpst slide or toggle switch

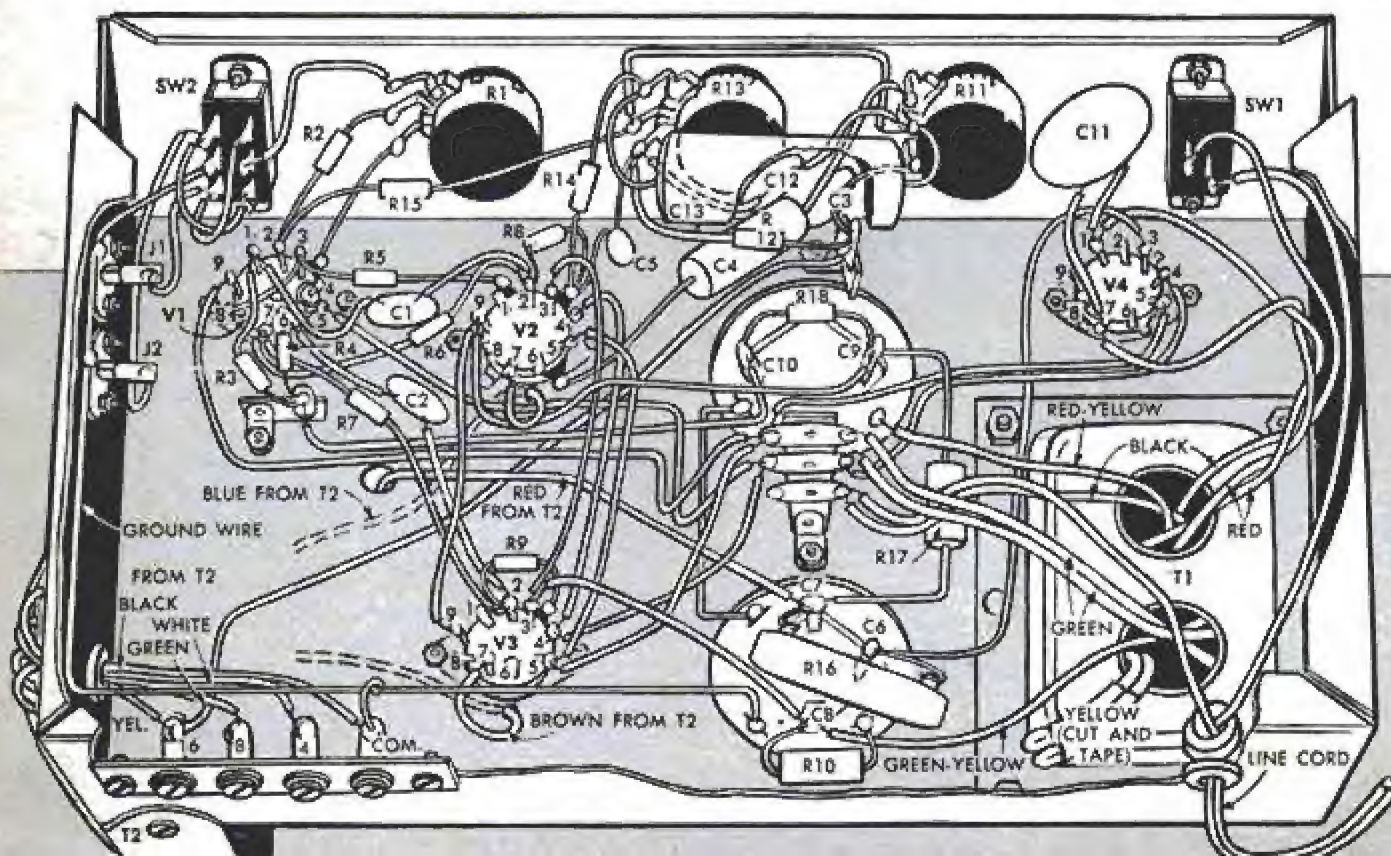
HARDWARE: Metal chassis, 9 1/2 x 5 x 2 1/2-in. or larger; line cord; 9-pin tube sockets w. ground lugs, Amphenol No. 59-400 (3); 9-pin socket w. ground lugs and shield base, Amphenol No. 59-400; tube shield; knobs; 4-screw term. strip; 3-lug upright term. strip; miscellaneous points, grommets, screws, nuts, hookup wire, bus (ground) wire, rosin core solder

Fig. 1. Schematic diagram of low-cost high-fidelity amplifier

Then, too, there's the question of amplifier specifications. In an effort to "meet and beat" competition, manufacturers are constantly striving for greater power, wider frequency range and less distortion. Their achievements have been remarkable. Many modern amplifiers have power ratings far in excess of anything ever likely to be used in the average living room. Frequency response has been pushed into the subsonic and ultrasonic regions and distortion is kept to a level far below that recognizable by the average human ear.

Ideally, a unit's performance *should* exceed the most stringent of practical requirements. Yet, beyond a

Fig. 2. Pictorial wiring diagram. Completed wiring should be checked against schematic diagram, above



practical limit, every watt of excess power, every fractional percentage of distortion reduction adds more to the cost of the unit than is compensated for by the improvement of music reproduction.

The amplifier shown here is unconventional by present-day standards. Instead of using additional parts and circuits in an effort to obtain theoretical perfection, it was designed with the view, "how much can be omitted without compromising practical listening quality?" The result is a neat little 10-watter which, performancewise, needs offer no apology to its more elaborate and more expensive counterparts.

Built entirely with readily available components, the amplifier is designed for use with a radio tuner and a good-quality crystal or ceramic phono cartridge. (For use with a low-output magnetic cartridge, a separate equalized preamplifier is required.) Two inputs and a front-panel selector switch permit rapid switching from tuner to record player and vice versa.

Compact Design

In the original model all parts were mounted on a small $9\frac{1}{2} \times 5 \times 2\frac{1}{2}$ -in. aluminum chassis, punched and drilled as shown in Fig. 3. This compact design presents no construction difficulties and permits the unit to be mounted in a relatively small space. However, due to the high power requirements of the output tubes, the chassis becomes quite warm and adequate ventilation must be provided. Where more space is available, the use of a larger chassis with its greater heat-dissipating properties is recommended.

Wiring the amplifier, as illustrated in Fig. 2, is simple. Following the layout shown will help prevent wiring errors and assure performance similar to that of the original model. Note that the red and blue plate leads of the output transformer, T2, enter the chassis through small holes located near the plate pins of the output-tube sockets. Keeping the major portion of these leads above the chassis reduces the possibility of oscillations caused by undesired feedback from output to input stages.

The electrolytic filter capacitors are mounted above the chassis on insulating Bakelite mounting plates and their ground lugs are connected together and to a ground wire which is grounded to the chassis only at the input jacks. Ground connections for most small parts are made to ground lugs on the saddle-type tube sockets of the stage with which these parts are associated. This wiring procedure eliminates ground loops and reduces amplifier hum to a level below audibility. Component leads should be covered with "spaghetti" wher-

ELECTRICAL SPECIFICATIONS

FREQ. RESPONSE: 1 db from 30 to 25,000 cps

HARMONIC DISTORTION: 1% at 1000 cps at 16 watts

POWER RESPONSE FOR LESS THAN 3%

HARMONIC DISTORTION:

16 watts from 100 to 5000 cps

11 watts from 30 to 10,000 cps

INTERMODULATION DISTORTION: 2% at 5 watts
(80 and 7000 cps signal at 4:1) 4% at 10 watts
5.8% at 15 watts

HUM AND NOISE: 70 db below 10 watts at max. volume
75 db below 10 watts at min. volume

SENSITIVITY: .6 volts in for 10 watts out

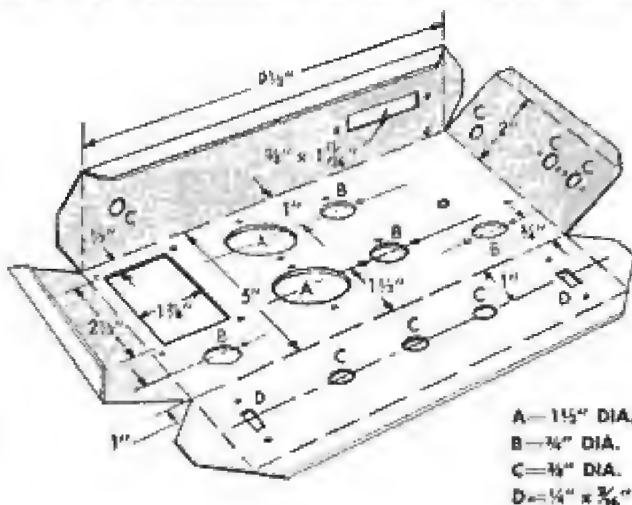
ever such leads might short out to the chassis or to the wire leads of some other part.

After completing the wiring, carefully check each connection to make sure that all are securely soldered. It is also a good idea to check the actual wiring against the schematic diagram of Fig. 1 in order to catch any possible wiring error.

The quality of music available from any hi-fi system is no better than that provided by the poorest component in the assembly. The use of a good quality amplifier, therefore, does not insure high-fidelity results unless the auxiliary units—the pickup and the speaker system—are capable of matching the performance of the amplifier. The relatively low cost of this amplifier will permit a greater outlay for a speaker, record player or phono cartridge where the increased investment will pay far greater dividends in terms of listening enjoyment (particularly in the low and medium-price ranges) than a corresponding expenditure for an amplifier with more spectacular electrical characteristics.

Though rated at 10 watts, this amplifier is actually capable of much greater power output before reaching the point where distortion becomes really serious. The associated loudspeaker should have power handling capacity of at least 20 watts.

Fig. 3. Chassis layout. Dimensions are approximate and may be changed to fit individual requirements





Repair accessories especially designed for printed-circuit chassis include: A. Various sizes and shapes of soldering wells to be used with temperature-regulated irons; B. special flush-cutting pliers; C. soldering aids with special tips for working in cramped quarters, and D. general purpose, regulated solder pot

TOOLS AND TIPS

By Leroy Wolff, Motorola Field Service Engineer

PRINTED-CIRCUIT chassis with their many production advantages over the more conventionally wired units are expected to be used eventually in virtually all electronic equipment. Trouble-shooting pro-

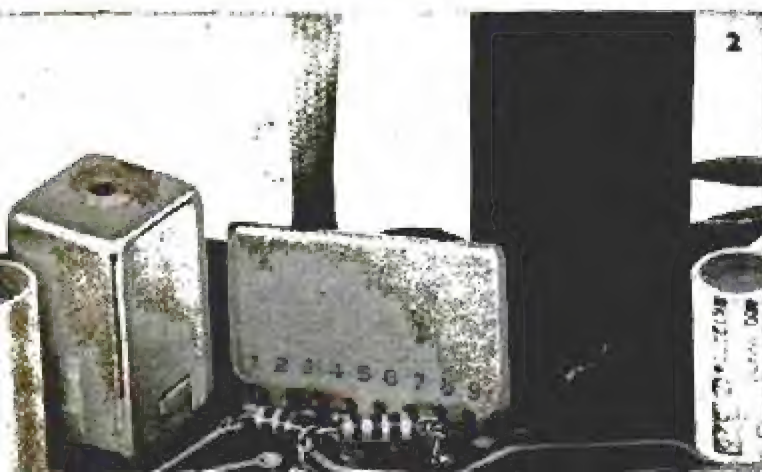
cedures for such chassis are the same as in the conventional ones but repairs, particularly the replacement of multilug components, involve a few tools and techniques not normally employed.

Fig. 1 shows the removal of a 9-lug component from a board, using a soldering-well accessory with a standard temperature-regulated iron. Well or solder pot should be kept brimful of 60/40 solder so that the board itself need not contact the edges of the pot. Molten solder in the well heats all connections simultaneously so that component can easily be removed.

Small parts, such as resistors and capacitors, often need not be unsoldered from the board in order to be replaced. Remove the defective part by cutting off the leads close to the body of the unit. The new part can be soldered to the old leads which still protrude above the board, as in Fig. 2.

Not all small parts mounted on printed-circuit chassis are as easily accessible as the resistor being disconnected in Fig. 3. The flush-cutting pliers shown, however, often reach points which are almost inaccessible to ordinary diagonal cutters.

The few tools shown above, supplementing those found in the average workshop, should prove adequate for any encounter with printed circuits.



The CRAFTSMAN



Camping Trailer

By Joe Ott

9323 ORILE Ave
Chicago 31

DESIGNED AND BUILT especially for a trip to Alaska, this fold-down camping trailer was thoroughly road-tested on the rugged Alcan Highway. Economical, high-speed towing is the main consideration in its construction, combined with generous living space for four persons. When folded for towing, the trailer is lower than a modern car, Fig. 1, thus offering a minimum of wind resistance. Utilizing airplane-type, stressed-skin construction for the upper portion of the trailer body reduces over-all weight by hundreds of pounds. Because the trailer is supported on four wheels, its weight seldom bears on the trailer hitch. This occurs only on very rough roads, as the tow bar has a pivoting action, Fig. 9, that accommodates considerable vertical motion. About 30 min. is required to set up the trailer completely when a campsite is reached. The setup is shown in Figs. 3 through 8. When the roof is raised, the rear wall, which is hinged to it, is swung down and fitted on the lower body, Fig. 3. The front wall is next,

being fitted in the same manner, Fig. 4. Then one side wall is put up, and the bunk beds in the end of the trailer are fitted one above the other, Figs. 2 and 5. The drawer-type side bunks now are pulled out, Fig. 6, and their side walls swung up in place. The completed trailer is shown in Fig. 8. Note in Fig. 7 that the bunk end walls are square. This original design was

Author's two daughters enjoyed trip to Alaska, each night sleeping most comfortably in bunk beds at end of the trailer

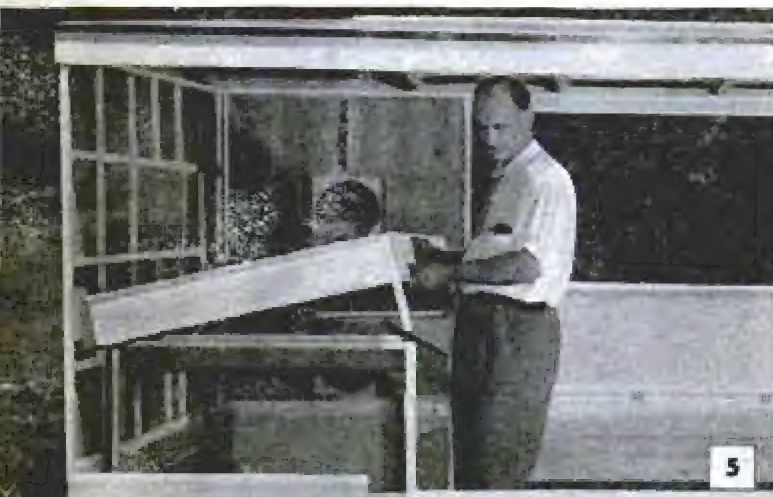




First step in setting up trailer is to raise one end of roof and swing down one end wall that is hinged to roof. Lower end of wall is screwed to trailer body



Second step is repeat of preceding operation on wall at opposite end of trailer. Setting up trailer can be a one-man job, but goes quicker with two



In this photo one side wall has been left off to demonstrate headroom inside trailer for 6-ft. man, and to show how bunk beds are set up on brackets

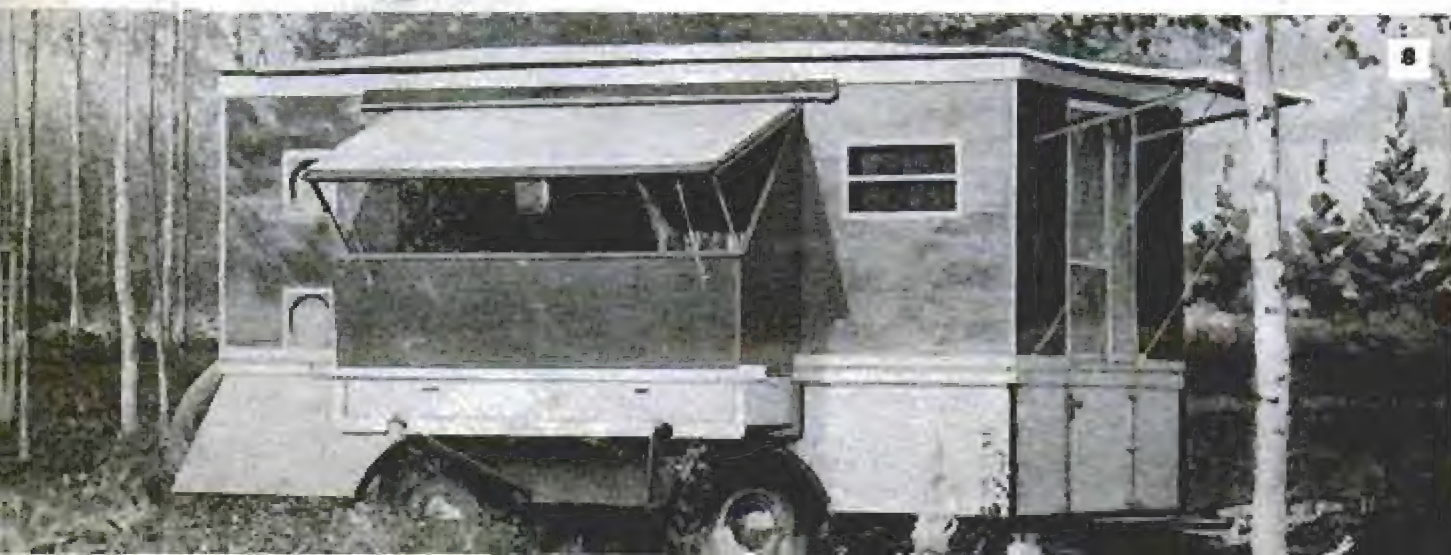


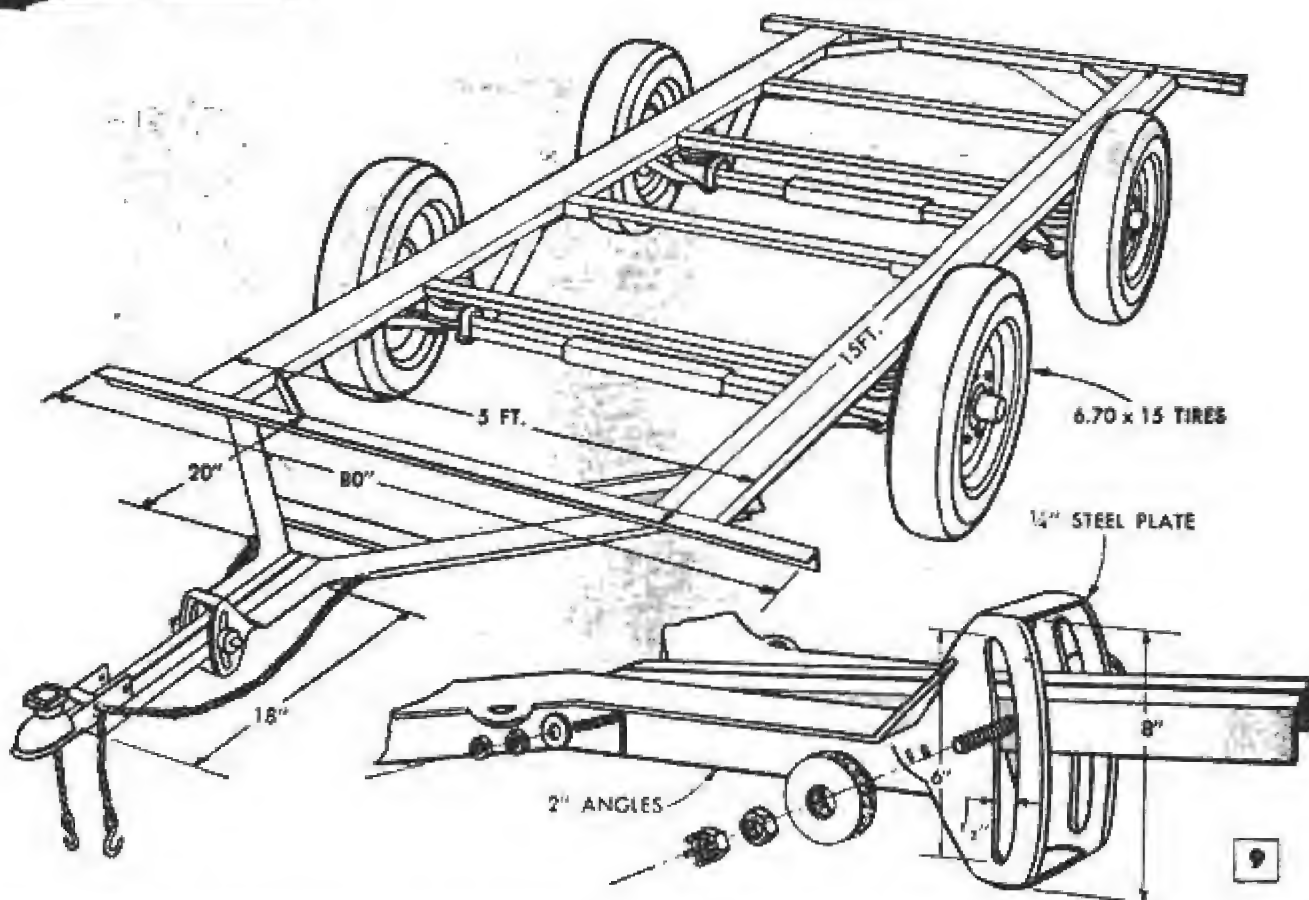
Drawer pulls attached to pull-out bunks permit handling them like bureau drawers. Hinged side walls of bunks then are raised and tubing brackets installed



Left, final step in setup is installation of side-wall panels. Square end panels on pull-out bunks were modified with triangular extensions as below

Below, spectators often expressed amazement at a full-sized house trailer popping out of the shallow trailer originally towed into the camping area

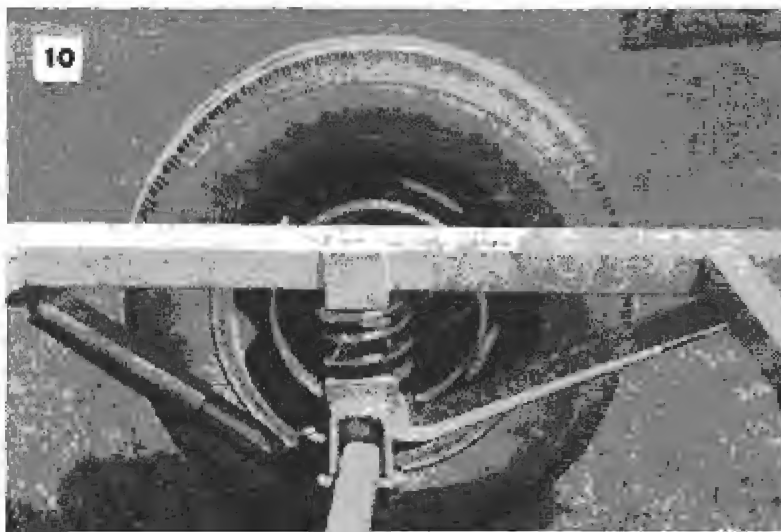


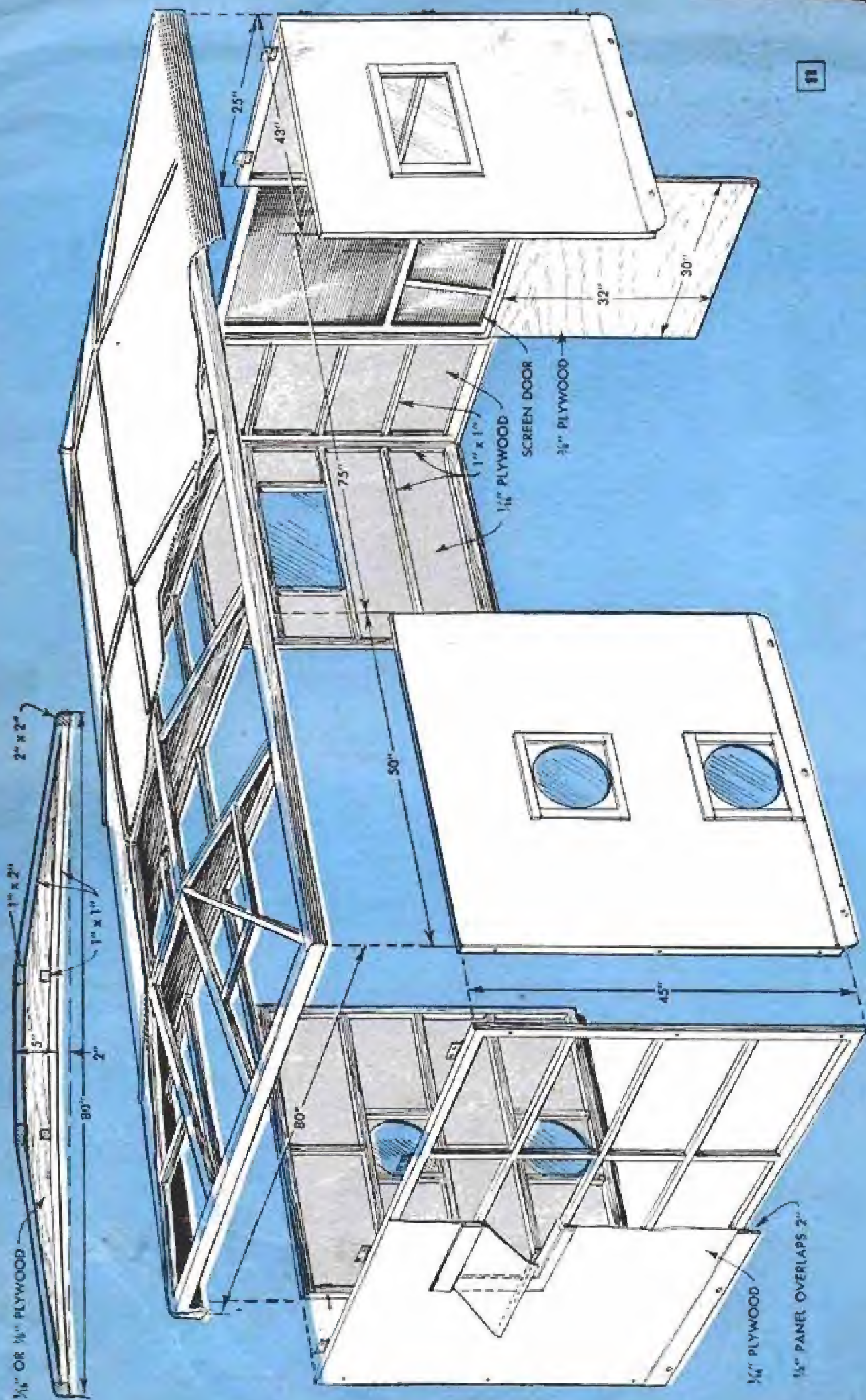


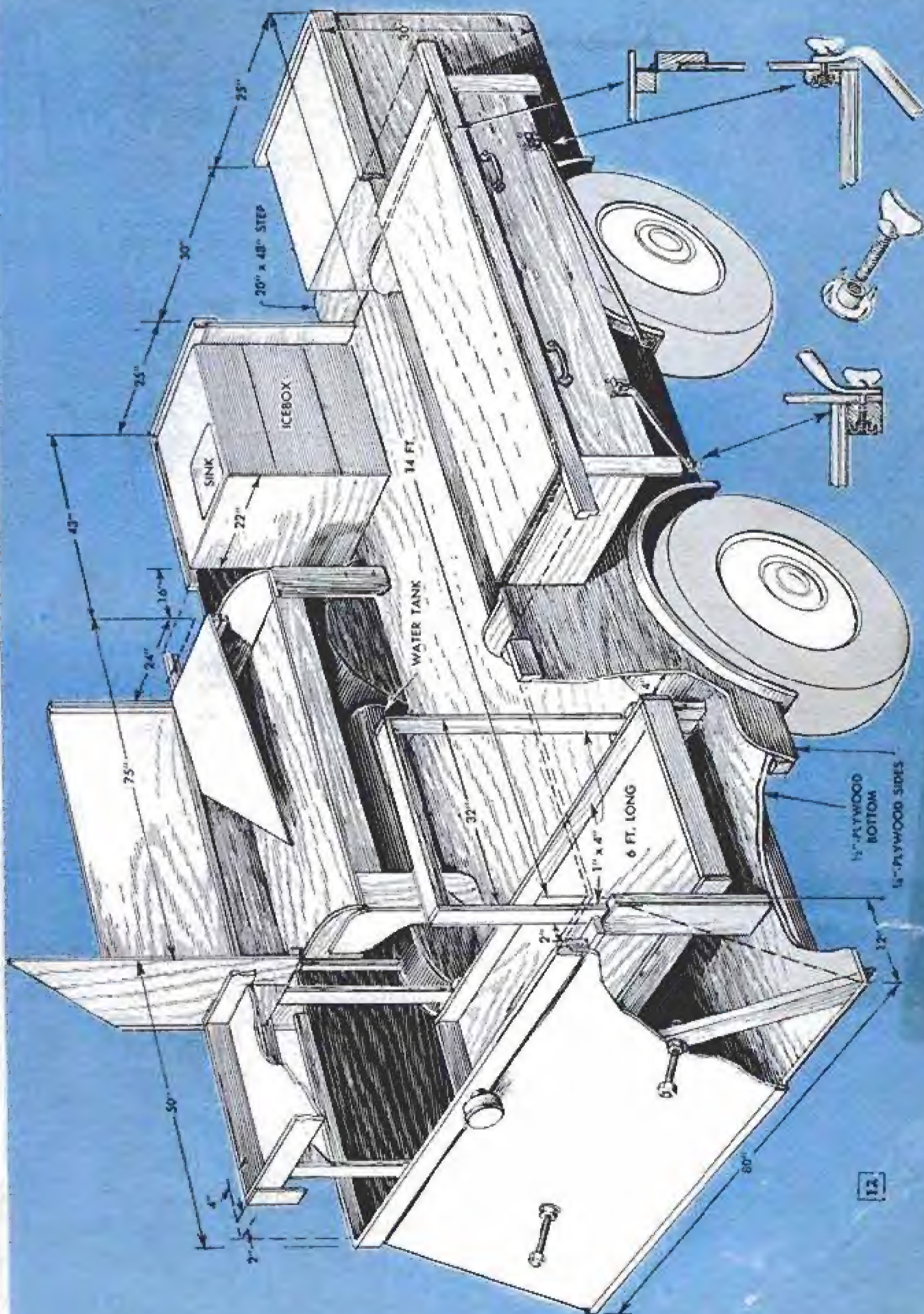
changed as shown in Figs. 8, 12, 15 and 16, to include a triangular-shape projection that supports an overhead panel, Figs. 8 and 15. The pull-out bunks are supported by brackets bent from thin-wall conduit. The brackets, as well as all removable panels and fittings on the trailer, are held by thumbscrews turned into nuts of the type shown in the details in Fig. 12. These consist of a threaded sleeve fitted on a collar that has projections on it. When the nut is fitted on the opposite surface of a piece of wood, over a drilled hole, turning a screw into it draws the projections into the wood, and the nut then will stay in place when the screw is removed. Thumb-screws and nuts used in the original trailer were $\frac{1}{4}$ -20.

Construction of the trailer starts with the welded, platform-type frame, Fig. 9. Side members are $\frac{3}{16}$ x 6-in. steel channels. The end crosspieces are $\frac{1}{4}$ x 2-in. steel angles. Four other crosspieces, spaced equidistant the length of the frame are $\frac{1}{4}$ x 1½-in. steel angles. Axles for the original trailer are the drop type that can be purchased at trailer-supply houses. Automobile front-wheel hubs are used with the axles. Because some wheels have roller bearings and others ball bearings, it is best to purchase car wheels and hubs from an auto graveyard first, and then buy the axles with spindles that will accept those bearings. To get the required tread on the original trailer, it was necessary to shorten a long axle. Conversely, a shorter

axle may be lengthened to suit. Two coil springs from the front axle of a car are cut in half to provide four springs for the trailer. In Fig. 10 is shown a suspension unit. The upper end of each spring is welded to the frame, and four short pieces of flat are welded equidistant around it to help position it. The lower end of the spring fits in a ring shaped from $\frac{3}{16}$ x 2-in. steel flat. The ring is welded to a 24-in. length of $\frac{1}{8}$ x 6-in. steel plate bent in a modified Z-shape. The lower horizontal portion of the Z-shape measures 5 in., the upper is 4 in. and is welded to the frame channel. Two U-bolts are welded to the ring around the lower end of each spring, providing a means of clamping the assembly to the axle. A shock absorber from a light car is fitted behind each spring. Note in Fig. 10 that the end of the angle cross member is "boxed" with a short piece of









Ribs of roof are $\frac{1}{8}$ or $\frac{1}{4}$ -in. plywood edged with 1 x 1 stock. Curved lower edges allow more headroom

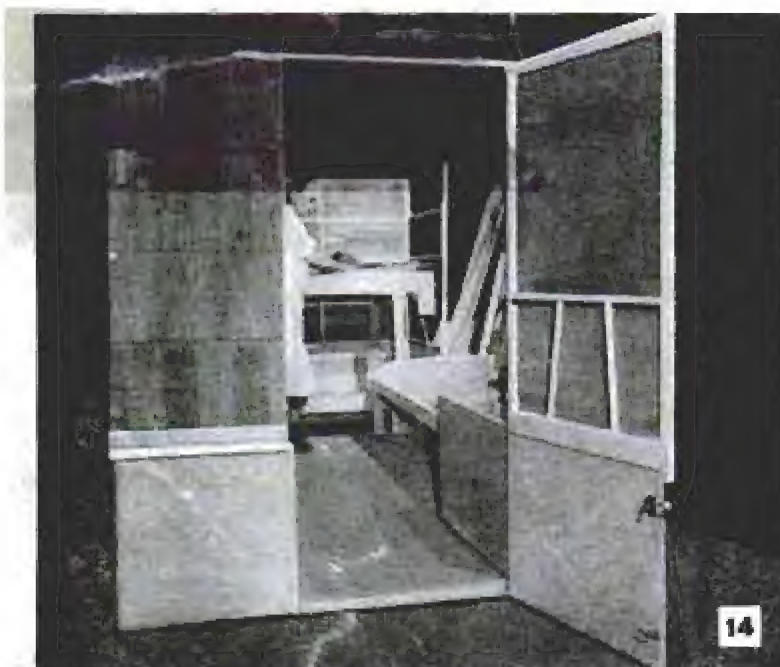
angle to provide a surface for welding the bolt to which the upper end of the shock absorber is attached. Details of the frame extension, made of 2-in. angles, and the tow bar, assembled from two 2-in. angles welded together, are shown in Fig. 9.

Fig. 12 shows the main, or lower, body. The floor consists of 4 x 8-ft. sheets of $\frac{1}{2}$ -in. exterior-grade plywood bolted to the frame and trimmed to fit, allowing 2 in. extra all around, to accommodate the 2 x 2 strips bolted to the lower surface of the floor along the outside edges. Strips of plywood now are nailed across the joints between the plywood, on the lower surface,

and positioned to butt against the frame members. These plywood strips, held by clinched nails, aid in keeping the body positioned on the frame. Cutouts also are made for the wheel wells. These are made by fitting trailer fenders into the cutouts and attaching a plywood semicircle to the inner edges of the fenders. If desired, the floor assembly now can be removed from the frame and the body finished separately Fig. 14. This is handy where overhead clearance is restricted. The sides of the lower body are $\frac{1}{4}$ -in. plywood on which are fitted strips of 1 x 3, rabbeted $\frac{1}{4}$ x 2 in. to produce a finish wall height of 30 in.

Note that the 1 x 3 strips on the pull-out bunks project 3 in. beyond the ends, requiring the strips on the fixed portion of the body to be shortened by that much, Figs. 6 and 12. Dimensions and details of the pull-out bunks are shown in Figs. 12, 15 and 16. These dimensions can be changed to suit, but remember that corresponding changes will have to be made in the side members of the body. A small sheet of plywood fitted at the head of a bunk will provide a "pillow effect" under an inflatable or other type camp mattress, Fig. 16.

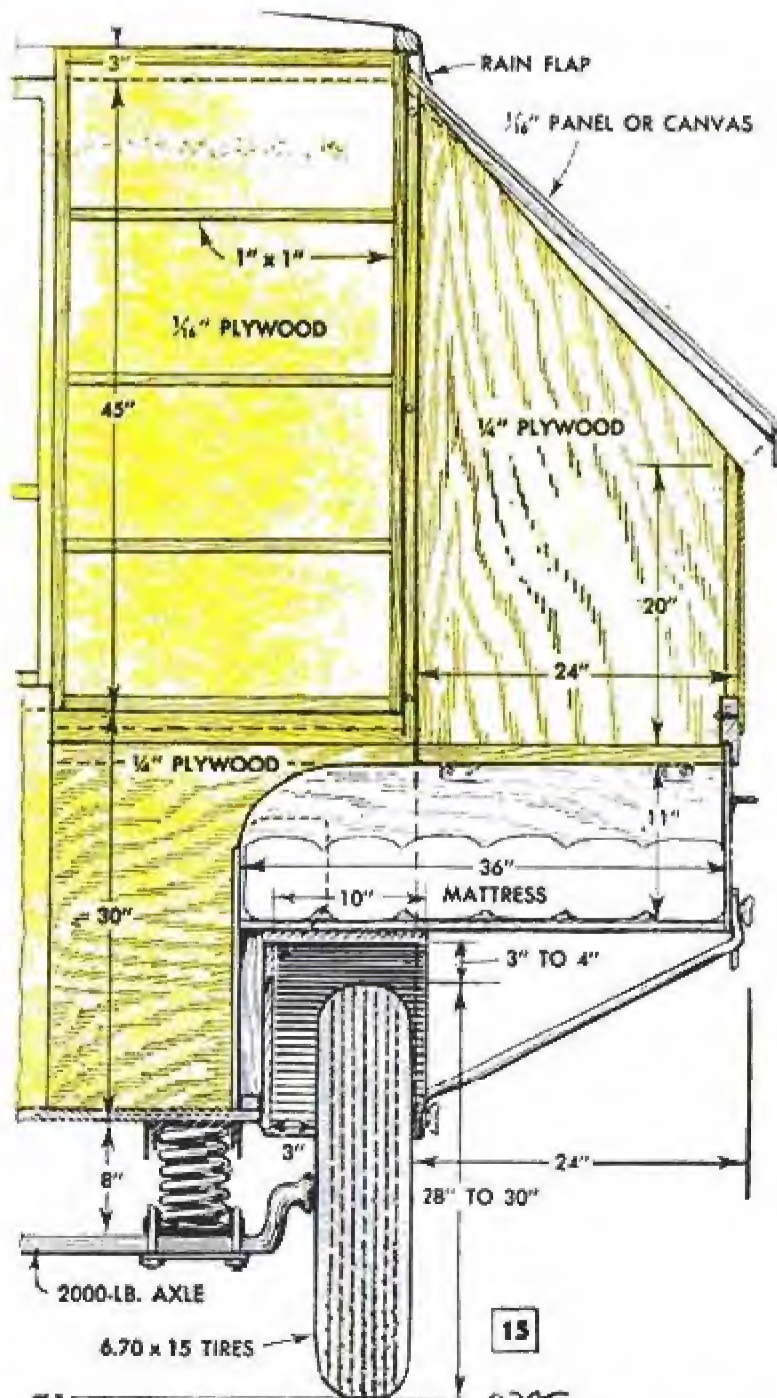
Located inside the trailer door are two cabinets. The top of one contains a small sink of the type used in trailers and boats. Under the sink can be installed a small, portable refrigerator or icebox.



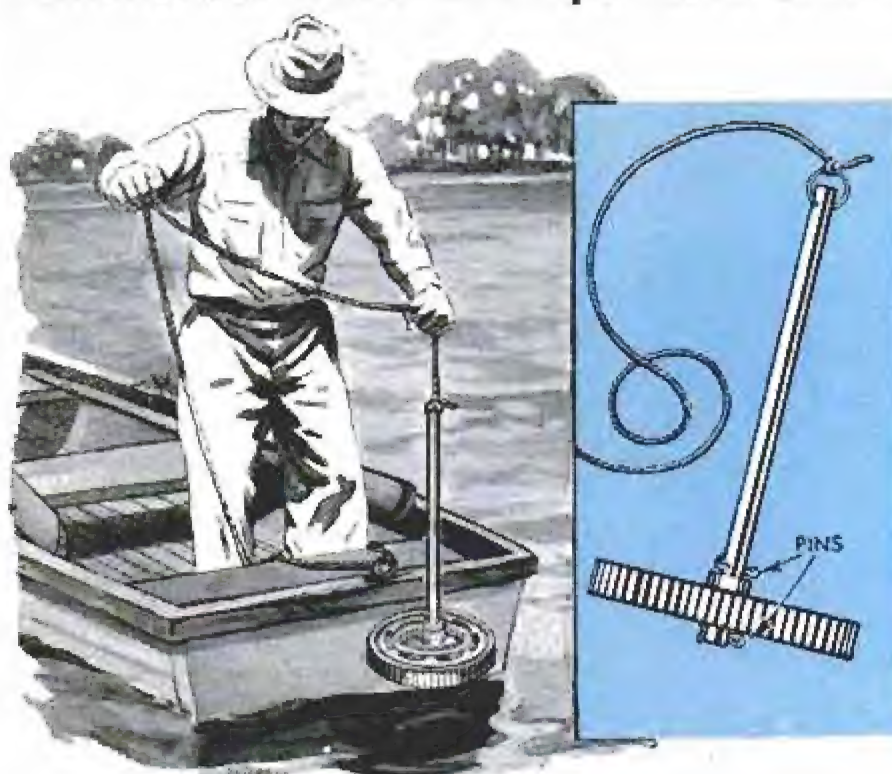
The other counter top is used for a three-burner gas range, for cooking. Beneath the counter is stored a tank of butane gas that supplies fuel for the range. Supports for the upper bunk at the rear of the trailer, Figs. 2 and 12, are U-shaped members assembled from 1 x 4 stock. Plywood gussets at the upper corners reinforce them. The lower ends of the supports fit in "pockets" formed from lengths of 1 x 2 stock and 1/4-in. plywood.

Dimensions and details of the method used to construct the upper side walls, end walls and roof are shown in Figs. 11 and 13. Each wall section consists of a framework of 1 x 1 stock, assembled with glue and nails, over which is glued and nailed a sheet of 1/4-in. plywood, light sheet aluminum or plastic-coated canvas. Felt weather stripping is tacked to all four edges of each side panel, and bottom and top of end panels. Adjacent panels are held together by thumbscrews and nuts of the type shown in Fig. 11. The same screws and nuts are used to hold the panels to the main body of the trailer, being fitted through holes drilled in a strip of 1/4-in. plywood on the lower edges of the panels, that overlaps the trailer body. The number, size and shape of the clear-plastic windows is optional. The upper half of the trailer door, Fig. 14 is a screen. But an optional cover of light canvas is suggested for chilly weather. Plastic-coated canvas is used to cover the trailer roof, Figs. 11 and 13. Battens are nailed over the canvas to the longitudinal members, and to alternate ribs, as indicated. The canvas is painted silver to minimize heat build-up under it caused by the sun. As indicated in Fig. 15, a strip of 1/4-in. plywood is fastened to the edges of the roof so that it projects down 3 in. A cutout can be made in the strip for each of the lean-to roofs over the pull-out bunks, and a rain flap used at these points. This will permit the roofs to be raised slightly.

Two spare wheels, including hubs and bearings are carried on the back of the trailer. They can be held by long bolts, as indicated in Fig. 12, or regular trailer-type wheel mounts can be used as on the original trailer. ★ ★ ★



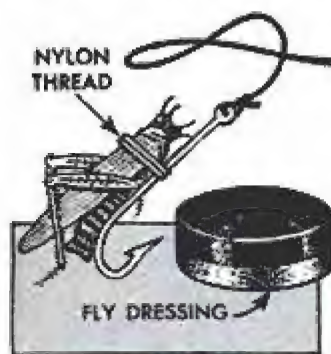
Lawn-Mower Wheel and Pipe Serve as Small-Boat Anchor



To provide a suitable anchor for a small boat, one fishing enthusiast mounted an iron lawn-mower wheel on one end of a short length of steel pipe as shown. The opposite end is drilled to take a steel ring to which the anchor line is tied. Cotter pins placed in holes drilled in the pipe on either side of the wheel hub hold the wheel on the pipe. The cotter pin at the end of the pipe may be removed and the wheel slipped off when desired for compact storage. Holding action is similar to a mushroom-type anchor. Any heavy wheel will do.—B. B. Peckins, Utica, N. Y.

Live Grasshopper Trout Fly

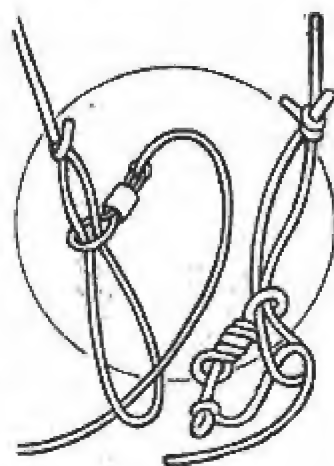
For a really tempting trout fly, one fisherman uses a live grasshopper bound to a hook with nylon thread of a bright color as shown in the detail. A No. 6 long-shank, straight-bend hook with a turned-down eye to which a No. 2x, tapered, dry-fly leader is firmly attached is recommended for this purpose. The body and wings of the grasshopper are rubbed with soft fly dressing to make it buoyant enough to float the hook and leader.



B. Robinson, Newcomerstown, Ohio.

Leader Quickly Attached

Instead of knotting a line to a fishline leader and cutting it each time the leader is removed, try this simple method of attaching and removing a leader as detailed. First, tie a permanent loop about 3 in. long at the end of the line. Then, slip the eye of the leader over the loop and bring the other end of the leader through the loop as in the right-hand detail. The procedure is reversed when removing the leader.



Coat-Hanger Pole Prop for "Huck Finn" Style of Fishing



Here is a handy prop for a cane pole when still fishing on a stream bank. Shaped from a heavy-gauge-wire coat hanger as indicated, the prop will permit both hands to be used for other purposes when desired.

Saw-Blade Safety Hint

When storing a bow saw, also some types of pruning saws, accidental injury can be prevented if the blade is removed and replaced so that the teeth face upward. In this way the frame acts as a guard.



FISH THE LITTLE LAKES

By George Laycock

SOME OF THE BEST fishing places in America are surprisingly close to your own back door. These fishing spots are the farm and ranch ponds that are large enough to accommodate a considerable population of game and pan fish, when properly stocked and cared for. If you don't happen to have such a little lake on your property, ask the owner of one nearby for permission to stock it for mutual benefit or as a local sports-club project. If

you live in an area without such a pond but are fortunate enough to have a suitable location and an adequate water supply on your property, a private lake can be made for little more than the price of an extended fishing trip. In the latter case, the local Soil Conservation Service representative can help you plan the pond, whether it is to be in a large suburban backyard or on a farm. If a large excavation is necessary, you can arrange to have a contractor do the

Fertilizer needed to encourage growth of microscopic plants in large pond is scattered on water from boat





Above, bass grow fat on balanced diet afforded by careful food and species control in small pond. Below, poison is sprayed on improperly stocked pond to kill entire fish population before restocking

work with a bulldozer. Usually, some type of dam and drainage system must be provided. You can build such a system yourself according to U. S. Department of Agriculture suggestions as outlined in their Leaflet No. 259. Every pond should be custom built to suit the landscape.

Fish for stocking your pond usually can be obtained free of charge from the U. S. Fish and Wildlife Service through your local Soil Conservation Service office. The service extends to existing ponds as well. One good stocking plan uses a combination of bluegills and largemouth bass. The bluegills eat insects, the bass eat bluegills and the fisherman eats both species of fish! Recommendations for pond stocking vary from state to state. Ohio pond specialists suggest 100 fingerlings each of bass and bluegills for each acre of pond water. A common stocking plan for southern states is 1000 bluegills to 100 largemouth bass. Here again, local conservation representatives will know the best plan for the area. Bluegills should be released in a pond between August and January, bass from March through June.

A pond should never be stocked with miscellaneous wild fish. The balance of life in a pond is a delicate one requiring prudent management. If there are more fish than the natural food available will support, the pond tends to become overcrowded with underfed, stunted fish. Where such an unbalanced situation exists, the best thing to do is to poison all



the fish and restock the pond with the proper proportions of each species. A one-acre pond with an adequate food supply can produce 250 lb. of fish a year for anglers and still have ample stock left to replace the ones hooked and landed.

In much of the fertile farmlands of the Midwest, farm ponds are kept fertile by plant foods washing into the water from surrounding fields. Through much of the South, however, ponds should be fertilized much the same as a field crop is fertilized. To do this, simply walk along the water's edge and throw fertilizer into the water. On larger ponds, fertilizer can be spread from a boat.

Most ponds that need fertilizing require 800 to 1200 lb. per year. A good formula to use is an 8-8-2 mixture. Other mixtures will do, but be sure the first two numbers, which refer to the nitrogen and phosphorus content, are equal. This plant food encourages the growth of millions of microscopic plants. These plants give the water a dark green or brown color called "bloom" and feed the insect larvae on which the bluegills fatten. It takes four to five lb. of insect larvae to make 1 lb. of bluegill, and four or five lb. of bluegills are needed to make 1 lb. of bass. Pond experts recommend that fertilizer be applied from two to

(Continued to page 224)



Farm pond was used by volunteer firemen as water source for fighting barn fire. Water pumped from pond was important factor in saving all cattle, house and several other buildings from destruction

Above, large-mouth bass provides fishing thrill for owner of one-acre fish pond. Below right, string of bass, bluegill, brem and catfish represent average catch from 48-acre fertilized pond on Texas ranch



Film Dries Without Streaks When Held in Horizontal Position



If it is inconvenient to hang rolls of wet negatives vertically for drying in your darkroom, try drying them as shown in the illustration at left. To do this, simply stretch a wire line at a convenient height and attach several clips to it so that the side of a film can be gripped by the clips as shown. In this position the film will dry more quickly without streaks.

R. Hertzberg, Douglaston, N. Y.

Rubber Stamp Dates Negatives

Because of the small size of its numerals, a No. 4 rubber date stamp is ideal for marking dates on photo negatives. The numbers, which are approximately $\frac{3}{32}$ in. high, fit easily in the clear spaces along the edges of negatives.

Use regular stamp ink and allow about 10 min. for it to dry thoroughly on the film.

Ken Murray, Colon, Mich.



Powder Stops Envelope Sticking

To prevent envelope flaps from becoming sealed in storage, dust the mucilage-covered parts with talcum powder. A discarded powder puff is a handy applicator for this purpose. Postage stamps and gummed labels can be similarly protected.

Pressure-Block Technique Aids Dry-Mounting Photoprints

When using dry-mounting tissues for mounting photographic prints on album pages or display boards, try using a wooden block to press down each print immediately after a section of it has been heated by an electric iron as shown. Air trapped between the tissue and print may cause them to separate shortly after heating. However, if they are pressed together in the manner explained, some of the heat will be dissipated while pressure is maintained, resulting in a good bond.



Cardboard Flap Protects Exposure-Meter Photocell

Here is an easy way of preventing damage to the light-sensitive, photoelectric cell in a camera-mounted exposure meter that is permanently open at the front. When such a camera is carried in shooting position by a neck strap, it is possible for direct sunlight to cause the meter needle to swing violently off scale. To avoid this, simply attach a cardboard flap of suitable size to the face of the exposure meter, using a strip of adhesive tape for a hinge as shown in the photograph below. To take a reading, raise the cardboard flap with a finger.



Lazy Susan Garden Table

HERE is a garden or patio table that is ideally suited for outdoor dining with its large rugged top and folding legs for compact storage. Designed as a companion piece to be used with the folding garden chair shown on page 165, it has a handy Lazy Susan mounted on top for serving condiments and appetizers. When moving the table, all you need do is fold the legs against the underside of the top and roll it to any location desired. The parts for the table are cut from stock lumber and assembled as shown in the drawings and details.



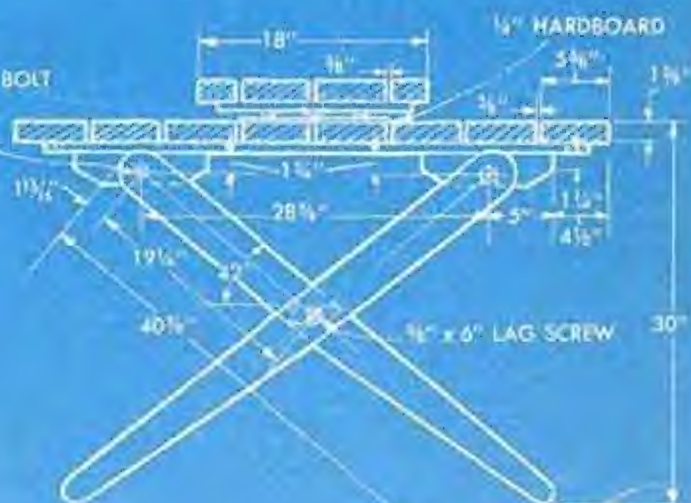
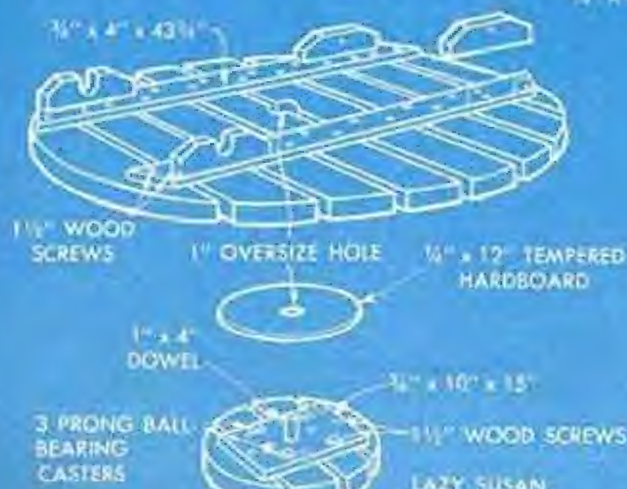
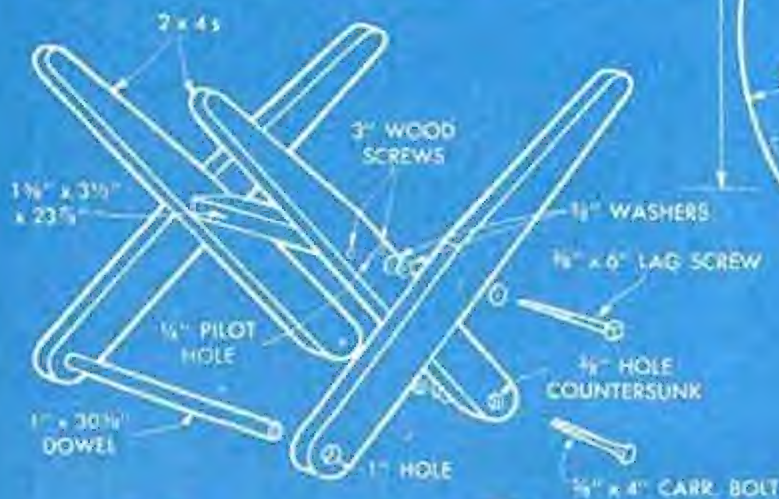
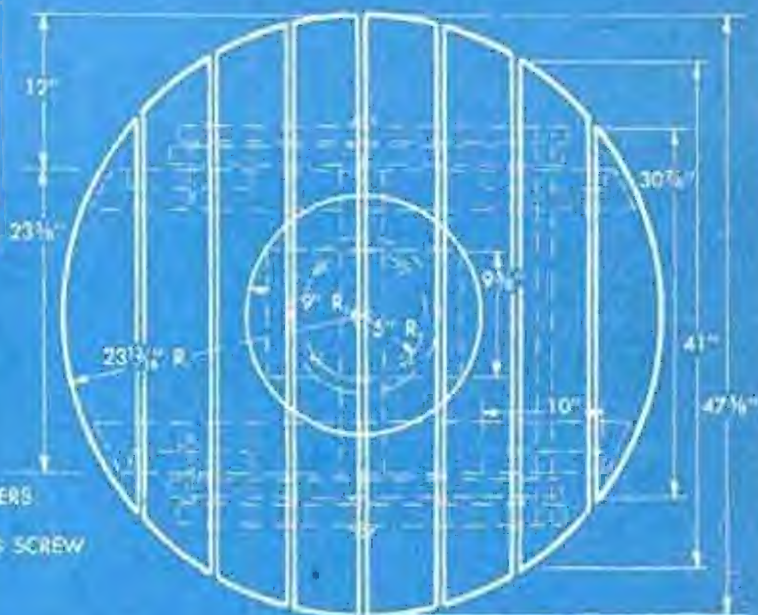
MATERIALS LIST

Lumber

- 2 pcs.—2" x 6" x 47 $\frac{1}{2}$ "—top members
- 3 pcs.—2" x 6" x 46"—top members
- 3 pcs.—2" x 6" x 41"—top members
- 3 pcs.—2" x 6" x 30 $\frac{1}{2}$ "—top members
- 2 pcs.—3 $\frac{1}{2}$ " x 4" x 43 $\frac{1}{2}$ "—top cleats
- 4 pcs.—1 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ " x 10"—leg cleats
- 4 pcs.—2" x 4" x 40 $\frac{1}{2}$ "—legs
- 1 pc.—1 $\frac{1}{2}$ " x 3 $\frac{1}{2}$ " x 23 $\frac{1}{2}$ "—leg spreader
- 1 pc.—1" x 36"—dowel
- 2 pcs.—2" x 6" x 18"—Lazy Susan top
- 2 pcs.—1 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ " x 13"—Lazy Susan top
- 1 pc.—3 $\frac{1}{4}$ " x 10" x 15"—cleat

Miscellaneous

- 1 pc.— $\frac{1}{4}$ " x 12"—tempered hardboard
- 4—3-prong ball-bearing casters
- 2— $\frac{3}{8}$ " x 6" lag screws and washers
- 2— $\frac{3}{8}$ " x 4" car. bolts and washers
- 4—3 No. 14 F. H. wood screws
- 8—2 No. 14 F. H. wood screws
- 48—1 $\frac{1}{2}$ " No. 8 F. H. wood screws





TAKE-APART COOKBOOK EASEL consists of two interlocking plywood cutouts jigsawed to suit book

Solving **HOME PROBLEMS**



CABINET PULLS can be made in quantity and in a jiffy if you start out with a length of parting strip, a stock molding sold at lumberyards. Slice off at an angle in 4-in. lengths, paint and attach with screws

CORK TOO SMALL? Drop it in boiling water for a few minutes. It will expand to its original size and fit tight once again



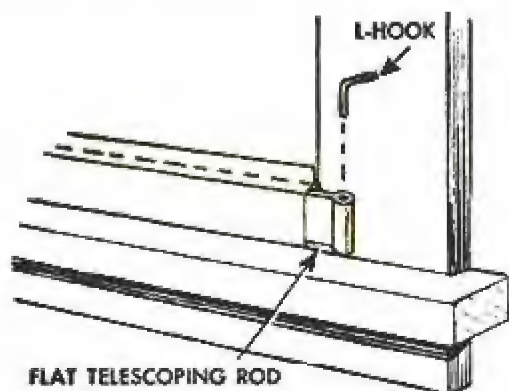
MOST CANISTERS are too large for storing many of the condiments used in cooking but you can make a neat set of miniature ones by attaching drawer knobs to tops of small cans having press-on lids



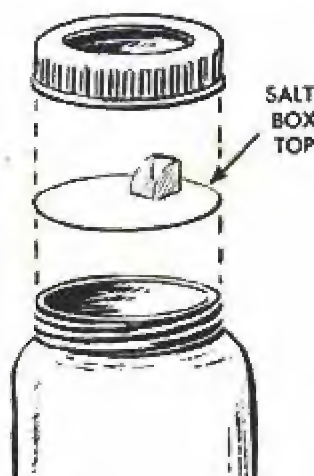
WIRE HAT HOLDERS not only save precious shelf space in a hall closet but they keep your hats in shape. Several holders can be formed from wire coathangers, bending them in the manner shown. Round-nose pliers will permit eyes to be formed in wire ends for roundheaded wood screws



SCREW HOOKS and a flat curtain rod will keep a window shade from flapping when a window is left open. Simply replace the wooden stick in the hem with the curtain rod and turn L-hooks into the casing. Pull the rod out at the hem far enough to hook ends over the two inverted L-hooks



HANDY DISPENSER for powdered soap is improvised by cutting the top and spout from an empty salt box and placing under a ring-type, fruit-jar cover. Cut the cardboard top same size as the regular metal insert. Spout permits pouring small amount and helps prevent waste as well as spillage

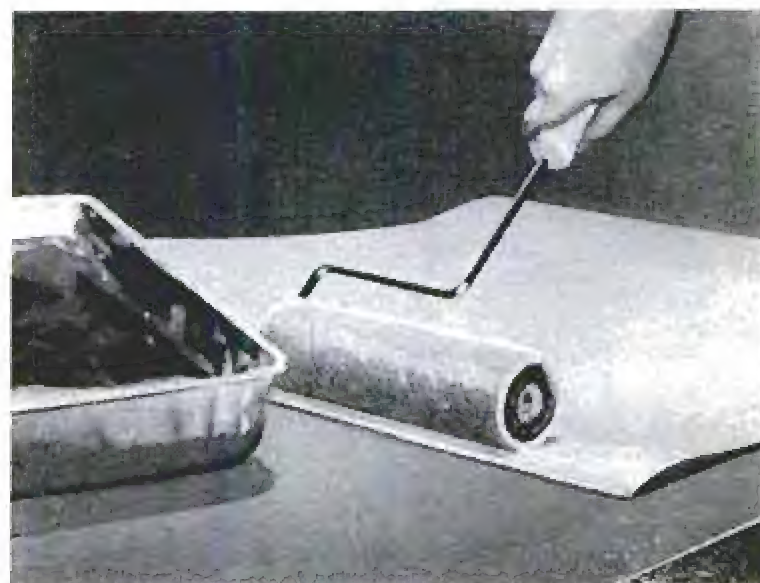


SEASONING FOODS with garlic may be done sparingly by placing the garlic inside a tea ball. Hooked over pan, it's a simple matter to lift the ball out by the chain when desired



PLASTIC SHEETING makes durable and practical book covers, particularly for shop and cook books since they can be wiped off easily when soiled. Lets you see title at glance

SPREADING PASTE on wallpaper will go fast and with a lot less mess if you use a paint roller rather than a brush. Use roller pan to hold paste and apply paste as you would paint



Special Pole Aids Cutting Tree Limbs With Extension Saw

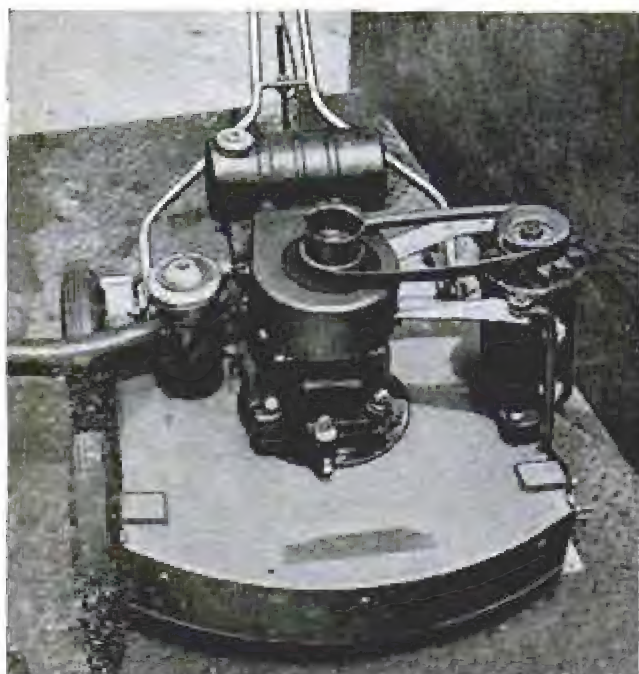


Forcing a tree branch downward to keep it under constant tension while cutting the branch with a pole extension saw reduces the tendency of the saw to bind in the kerf. A long wooden pole or length of thin-wall conduit with a hook fastened to one end enables you to do this with one hand while using the saw with the other as shown in the illustration. A suitable hook can be made for this purpose from a length of $\frac{1}{4}$ x 1-in. flat iron drilled and shaped as shown in the detail and then fastened to one end of the pole with stove bolts. When cutting a limb, first undercut, or notch, the underside with the saw. This will prevent splitting of the remaining part of the limb.

Portable Generating Unit

To improvise a portable 6 or 12-volt emergency generating unit for charging batteries or supplying electrical current for other uses, mount an automobile generator of the required output on your power mower as shown in the photo below. An adjustable support bracket on one side of the generator permits removing the belt when desired.

Harry J. Miller, Sarasota, Fla.

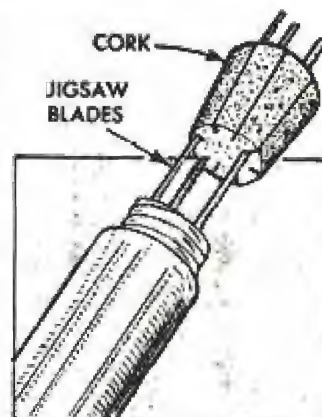


Eraser Used as Burnishing Wheel

Here is a means of converting a circular-type typewriter eraser into a burnishing wheel for small metal work. To do this, first remove the brush and its metal holder from the eraser and insert an 8-32 x $1\frac{1}{4}$ -in. roundheaded machine screw in the center hole. Secure the screw to the eraser with a nut and then chuck the screw end in a portable power drill.

Jigsaw Blades Stored in Bottle

Jigsaw blades are kept in a cork-stoppered bottle for convenient selection by one home craftsman in the manner shown. Vertical slits cut in the side surfaces of the cork accept the upper ends of the blades so that blades of various types are kept separate from one another for easy selection. To prevent the blades from rusting, they should be coated with a light film of machine oil each time after using. Beeswax is even better if you have it.





FOLDING GARDEN CHAIR

LIST OF MATERIALS

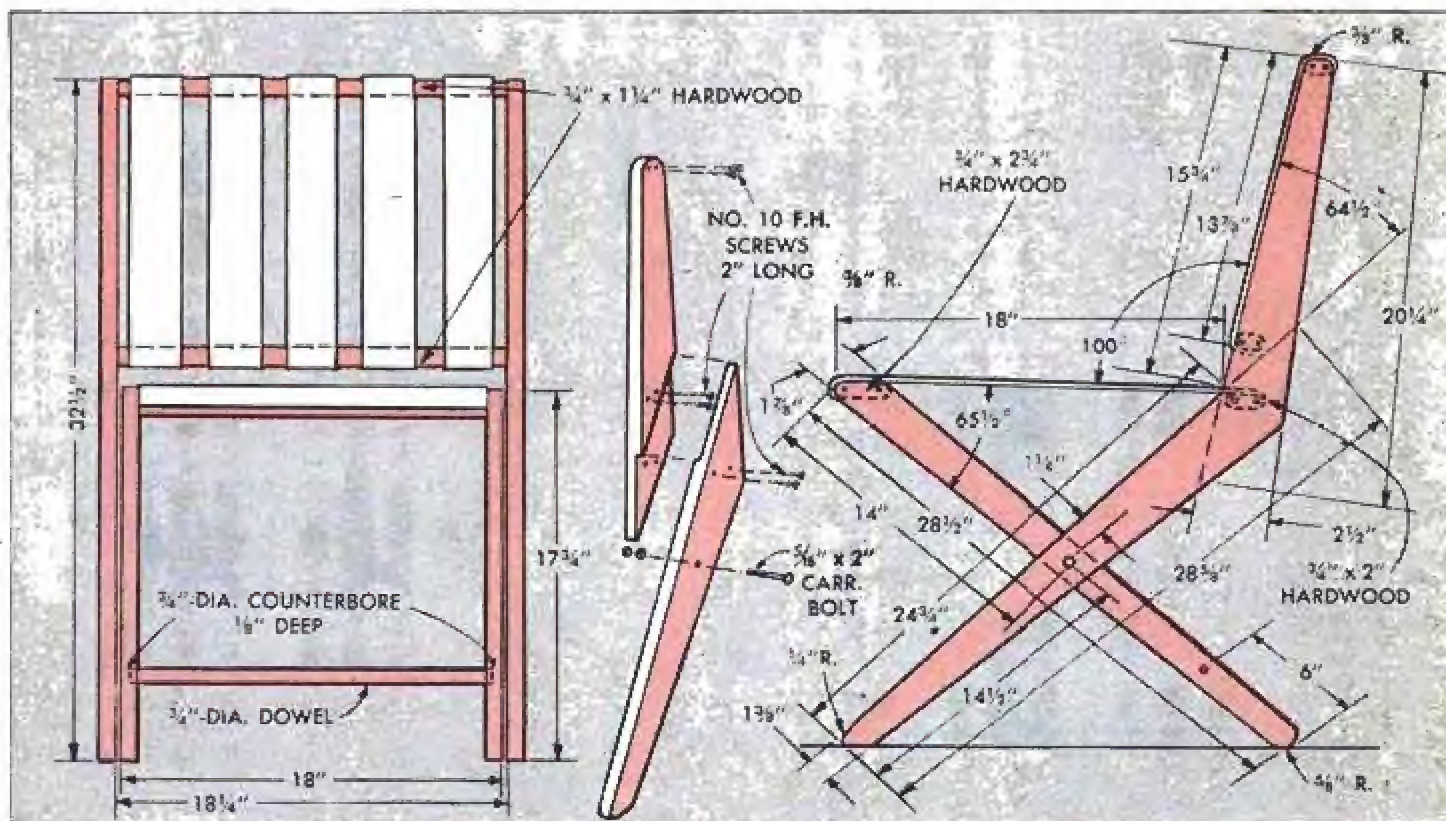
Hardwood lumber

- 2 pcs.— $\frac{3}{4}$ " x $1\frac{3}{8}$ " x $28\frac{1}{2}$ "—front legs
- 2 pcs.— $\frac{3}{4}$ " x $2\frac{7}{8}$ " x $28\frac{5}{8}$ "—back legs
- 2 pcs.— $\frac{3}{4}$ " x $2\frac{1}{2}$ " x $20\frac{1}{4}$ "—back members
- 1 pc.— $\frac{3}{4}$ " x $2\frac{3}{4}$ " x $16\frac{1}{2}$ "—front seat rail
- 1 pc.— $\frac{3}{4}$ " x 2" x $18\frac{1}{4}$ "—back seat rail
- 2 pcs.— $\frac{3}{4}$ " x $1\frac{1}{4}$ " x $18\frac{1}{4}$ "—seat back rails
- 1 pc.— $18\frac{1}{2}$ " x $\frac{3}{4}$ "—dia. dowel

Miscellaneous

- 2— $\frac{5}{16}$ " x 2" carriage bolts
- 4— $\frac{5}{8}$ "—dia. washers
- 18—2" No. 10 wood screws
- Furniture canvas or plastic webbing

FEATURING an attractive modern design and sturdy construction, this comfortable garden chair is ideal for most outdoor uses since it is lightweight for easy carrying and it can be folded for compact storage. The chair can be used singly, or several can be made as shown and used as a set with the matching folding table illustrated on page 161. If you should decide to make more than one chair, time can be saved by cutting and preassembling the first one, then disassembling it and using the members as patterns for making additional chairs.—John Bergen, Chicago.



"PLASTIC SURGERY" For a GLASS-FIBER BOAT

By V. Lee Oerle

DON'T PUT OFF repairing gouges, nicks and scratches in the hull of your glass-fiber boat. While insignificant now, this small amount of damage may in time develop into an unsightly patching job or make the boat unsafe for use without major repairs. The only materials that you'll need for this type of repair are a small can of polyester or epoxy resin, some hardener or "catalyst," acetone and a few miscellaneous items, such as sandpaper, putty knife, cellulose tape and a few cardboard squares. Although it's the more expensive of the two types of resins, epoxy should be used since it shrinks far less than does polyester and adheres better. Also, you can be prepared for emergency repairs when fishing or boating by carrying one of the convenient repair tubes available at most marine-supply stores. These tubes are divided internally into two parts for easy mixing of the resin with the hardener. Regardless of the type of resin used, the manufacturer's directions should be carefully followed and the following steps taken to insure a first-rate job.

1. Prepare the surface: This means a thorough scrubbing of the hull with a detergent-and-water solution followed by several fresh-water rinses. Do not use an abrasive or any other cleaning material that may scratch the glass fiber. If there is paint on the hull, it must be removed from the repair areas and the surfaces lightly sanded to provide a good "tooth" for the resin mixture. This should be done

before scrubbing to assure a dustfree surface. When the size of the boat permits, the boat should be overturned so that the gunwales rest on discarded tires for easier cleaning and repairing as shown at the top of the next page. After the boat is dry, swab off the repair areas with acetone or a hydrocarbon solvent to remove all traces of oil or grease.

2. Organize materials: This is a very important step because once the hardener is mixed with the resin you have from 15 to 30 minutes to coat the various surfaces involved, depending upon the amount of hardener added and the atmospheric temperature. Special retaining jigs, such as the cardboard square taped to the transom of the boat in Fig. 2, must be prepared before mixing the resin. For repair situations, such as punctures and cracks that require glass-fiber cloth strips for reinforcement, the necessary pieces should be cut to fit and conveniently located for later application.

3. Preparing the resin: The resin and hardener must be mixed exactly to the proportions recommended by the manufacturer. Don't add more hardener than called for to speed the curing process. This will hasten the job somewhat but very likely will cause bad surface checking. Also, it is important to pour the hardener slowly into the resin and mix them thoroughly to avoid air bubbles in the finished job.

4. Application and finishing: If you are using epoxy resin, it is a good idea to wear

Cardboard square taped to transom to overlap damaged bottom edge retains resin to form required corner





rubber gloves to avoid skin irritation. Gouges and deep scratches can be filled with a small brush, Figs. 2 and 3. When filling a gouge on an angled surface, place a strip of tape over the fresh resin to keep it in place as in Fig. 4. Loose hardware that cannot be mechanically tightened, such as the bow ring in Fig. 6, is "calked" by flowing epoxy resin on the contacting surfaces. This type of resin bonds to metal, polyesters do not. Hardening takes longer in cold, damp weather, so allow extra time under such conditions. Heat lamps, if available, may be used to hasten hardening. A surface is sufficiently hard for finishing when the resin cannot be gouged with a fingernail. Use a body file and a block sander with fine grit sandpaper for final touch up of the repaired areas. ★ ★ ★

Below, after resin has hardened, cardboard square is removed and excess material is sanded away

Fig. 3. Epoxy-resin mixture is flowed into deep scratches on keel of hull with small paintbrush. Several coats are required



Fig. 4. Tape is used for holding resin mixture in gouge on vertical surface. Below, loose bow ring is "calked" with epoxy resin



Gasoline-Powered Lawn Mowers Started With Electric Motor

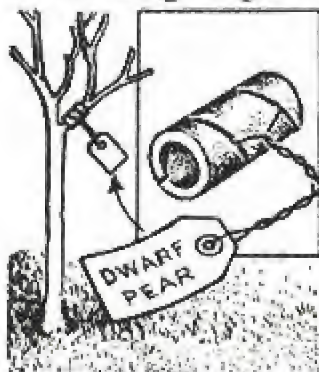


Small gasoline motors, whether mounted vertically or horizontally on power mowers and other equipment, may be started without physical exertion by using an electric motor mounted in one of the ways indicated. A pulley on the motor and engine are coupled with a V-belt that is dropped off by moving the mower after the engine starts.

Felt in Polish Can Rust-Proofs Tools

Garden and workshop tools can be kept bright and rust-free by using an empty shoe-polish can in which a length of felt weather stripping is coiled. The felt is soaked with oil and the device is used to wipe tools after they are used.

Attaching Tags to Young Trees



Instead of using wires, which might injure a young tree if left in place too long, attach identification tags by means of lengths of spirally cut rubber hose. The tags first are wired to the hose sections, then the sections are slipped over

the branches of the trees. The hose will expand as the tree grows, causing no injury.

Digger Trims Strawberry Plants

To assure healthy plants, the rapidly growing runners that are produced on newly planted strawberries should be cut back as soon as possible. A quick method of doing this is to use a digger consisting of a 1-gal. can from which the bottom is cut. A handle is made from steel flats and a broomstick.

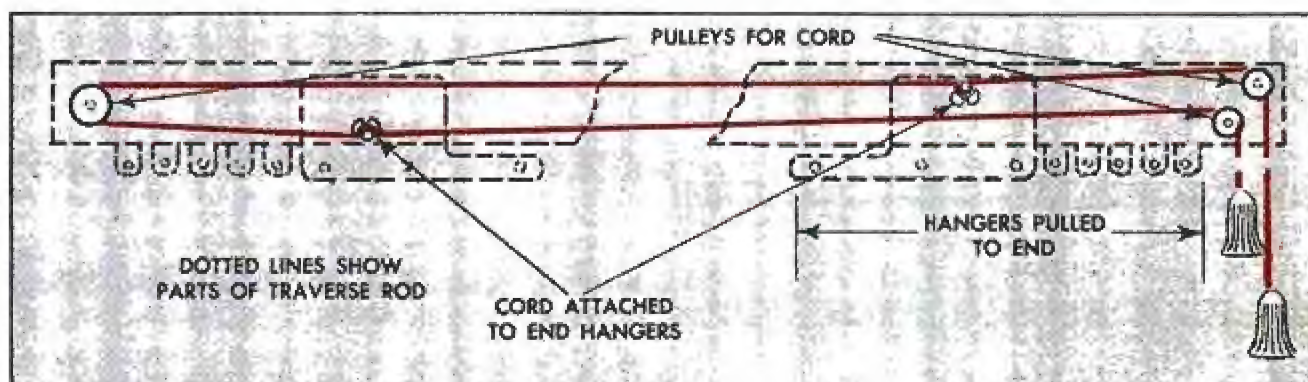


Staples Control "Soaker" Hose

One problem with soaker hoses is that they sometimes are difficult to position. "Staples" bent from coat-hanger wire can solve this problem. Narrow staples, such as the one shown to the right on the stretched-out soaker, permit the hose to be held on edge so the water spray is directed to one side, as when watering a flower bed. A wider staple, at left, will hold the soaker flat. When storing the soaker, use a long staple, with a rubber band fitted over the open end, to keep the soaker from unwinding.—Ed Packer, Pompano Beach, Fla.

Replacing the Cord In Traverse Rods

Replacing a broken cord in a drapery traverse rod is not difficult if you note the proper arrangement of hangers and cord when removing the latter. Insert the new cord at the "pull" end of the rod and place it over the proper pulley or bearing surface. Thread the cord through, as shown in the detail, going around the pulley at the opposite end. Top and bottom portions of the new cord should be approximately parallel and should not cross. After the cord is installed, adjust the sliding halves of the rod to the correct width, center the big hangers, adjust the cord lengths, then attach the cord to the hangers.



Wipe-on Shellac Applicator

Need a small-amount applicator for spreading shellac over knots and resinous areas of a wooden surface to be painted? Fill a cleaned mucilage bottle with shellac and apply it through the rubber tip in the same manner as mucilage. Dried shellac will seal the tip, flexing the tip breaks the seal to permit easy application.



Soldering-Iron Cleaner Block

Keeping the tip of a soldering iron clean while working with it is no problem if you keep a "scratch block" handy. The block is a scrap of wood to which a sheet of sandpaper is thumbtacked. Occasionally drawing the tip of the hot iron across the paper will remove the accumulated scale and keep it smooth and clean.





BOZO

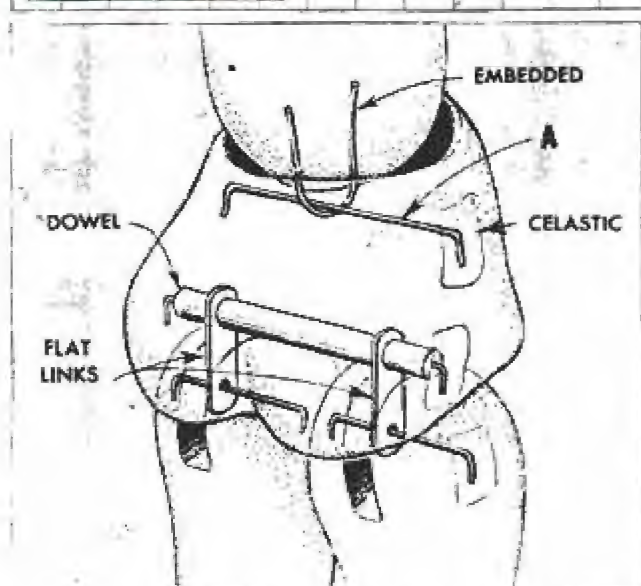
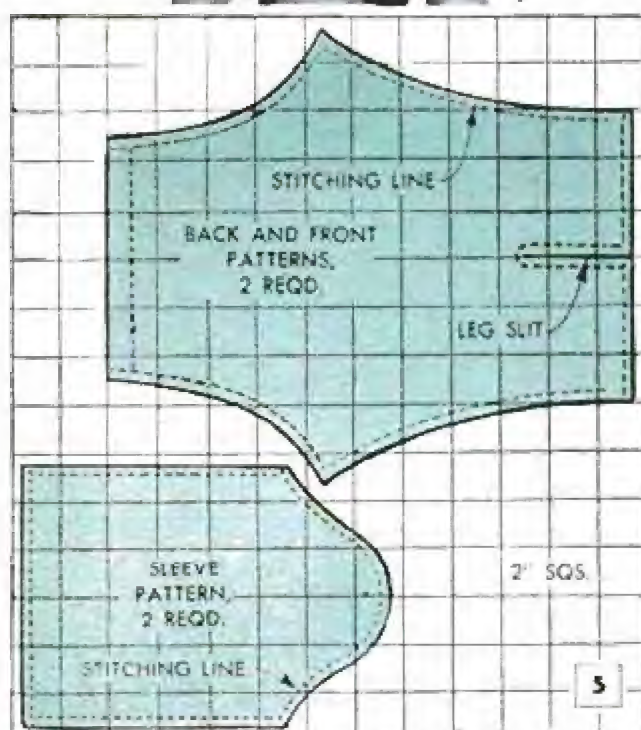
THE PUPPET

PART II

By Dorothy Rankin

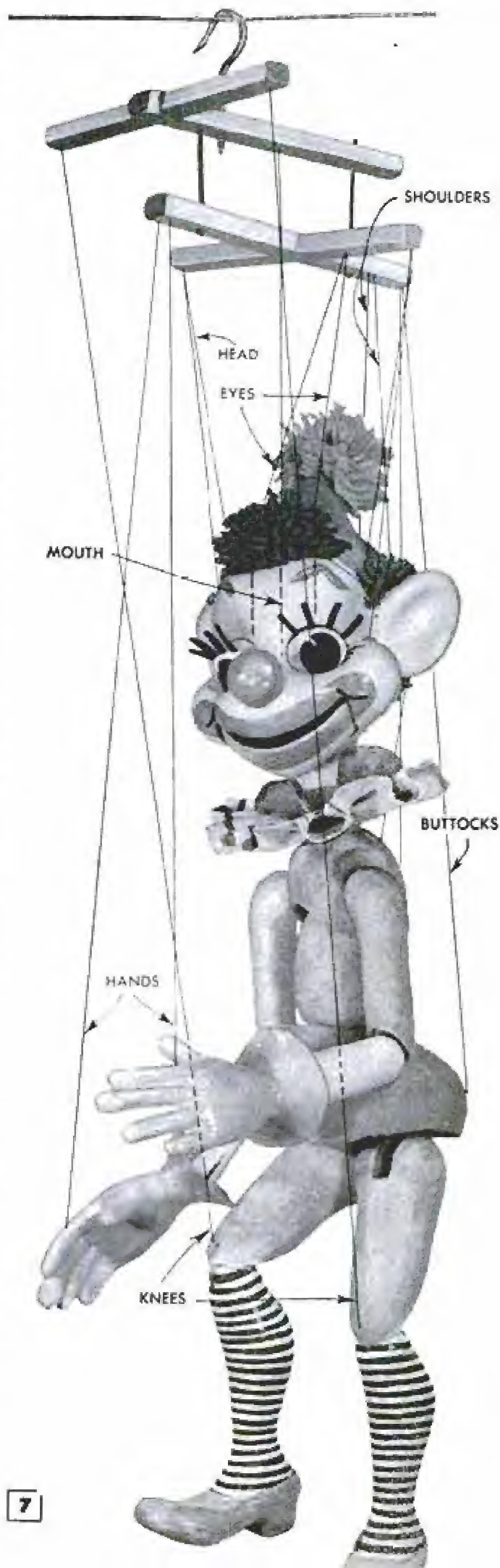
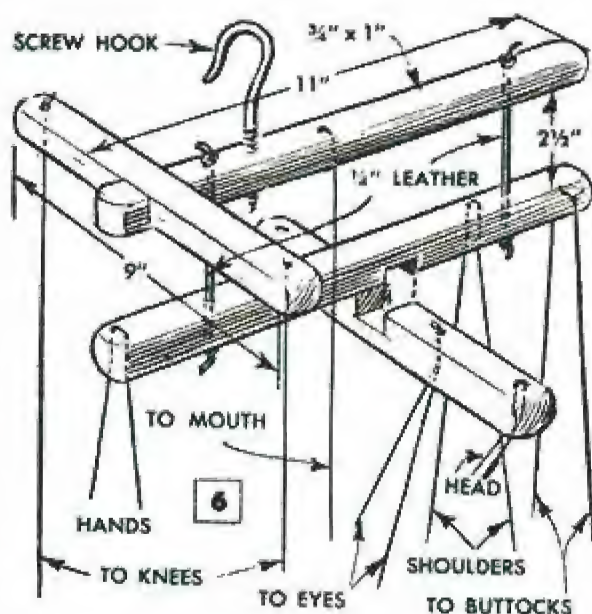
YOU'LL FIND BOZO a most agile fellow due to the unique manner in which the various parts of his body are joined together. The trunk sections, for example, all fit together in a "ball and socket" arrangement to form a loosely jointed assembly which lets Bozo walk, sit and bend in a lifelike manner. The detail below Fig. 5 shows clearly how flat metal links are used to join the legs to the hip section. These are pinned crosswise in the thigh slots and inside the hip section with lengths of coat-hanger wire, the ends of which are bent downward on the outside and anchored with bits of plastic cloth. Inside the hip section, pieces of dowel drilled lengthwise and threaded onto the wire serve as spacers to keep the flat links properly spaced. Drill the holes in the links a little oversize to obtain a floppy, loose-type assembly. The same detail also shows how the hip section is loosely joined to the ball end of the lower trunk section. Here a length of wire shaped like a hair-pin is embedded in the end of the trunk. Then wire A is inserted crosswise through the extending loop and holes in the hip section. As before, the ends of the wire are bent downward on the outside and held with plastic cloth. Cement can be used to help hold the embedded wire in the trunk. The shoulder section, which forms the upper section of the trunk, is attached by merely passing a wire crosswise through both parts, bending the wire downward on the outside and taping with plastic cloth. In studying Fig. 1, Part I, you'll see that the shoulder section sits down over the trunk somewhat to form a ball-and-socket joint.

The arms are attached to the shoulder section with a length of $\frac{3}{8}$ -in. leather lacing which is run from one side to the other through holes in the armpits and left to protrude at each side for embedding in the knob ends of the arms. After being embedded there should be about 1 in. of the leather strip left exposed at the armpits to provide free movement of the arms



in all directions. The head is joined to the body with a hairpin-shaped wire which also is embedded part way in the center of the shoulder section after interlocking it with the wire loop previously installed inside the neck. Flat links are likewise used in the elbow, knee and wrist joints and a study of Fig. 1, Part I, will show you how the links are crosspinned in the limbs. In each case, one end of each link is embedded and crosspinned to anchor it securely. Slots in the adjoining members allow them to slip over the protruding ends of the links and be pinned. Free movement of the parts should be maintained at all joints. Bozo's shoes are pinned to his ankles by passing lengths of coat-hanger wire crosswise through both shoe and ankle and then bending the ends of the wire downward before covering with plastic cloth and wood putty. Fishline is used for the strings to manipulate Bozo and this is anchored to the various movable members of his body with bits of plastic cloth in the following manner: First tie a piece to the end of the fishline and then dip it in acetone. Now push it through a hole in the member. Once inside, it springs back into a straight shape, like a toggle bolt, and hardens. Follow Fig. 7 in locating the strings. The head and shoulder strings actually support Bozo when he is just hanging around waiting to perform. Two head strings are used on each side of the head. One enters a hole at the top of the ear juncture and the other near the corner of the eye. Only two shoulder strings are required and these are attached at the top of the back about $\frac{1}{2}$ in. from the armpits.

Bozo's clown collar, Fig. 4, is formed from a strip of plastic cloth about 3 in. wide. It's fashioned with acetone into a starched ruffle about 8 in. in diameter and joined





together at the back after placing it around the neck. A second but smaller ruffle of red net is shirred and drawn around the base of the neck to hide the wire connections. This, of course, is done after the head and collar have been painted.

Give the head and collar several coats of flat, chalk-white paint and then paint the nose, mouth, hat and eyebrows pink. The eyeballs are painted light green above the eyelashes and white below. The pupils are done in black, as are the eyelashes. Paint the pupils large, about 1 in. in diameter. The top part of the head is designed to represent the turned-up brim of the clown hat and this portion is painted pink, $1\frac{1}{2}$ in. wide, all around the top of the head to match the color of the conical crown which wedges inside the head. A pink stripe $\frac{1}{4}$ in. wide is also painted around the outer edge of the ruffled collar, $\frac{1}{2}$ in. in from the edge. Bozo's hands and shoes are done in light green and his white stockings are given black stripes. There is no need to paint the rest of his body as it will be covered by his clown suit, the patterns of which are given in Fig. 5.

Bozo's kinky hair consists of red wool yarn which is glued to the head with liquid plastic, or other cement, and then snipped off short. A clump of hair is added at the front and a fringe of yarn is applied around the nape of the neck from ear to ear. A yellow-yarn plume is added to the top of the hat.



In these two photos puppeteer Rankin demonstrates how strings are pulled with fingers of left hand to make Bozo wink and wave as he walks along. By tilting the control bar from one side to the other, which raises the knees alternately, you can walk the puppet in most lifelike manner



Fig. 6 shows how the control bar is made and how it is strung up. It should be about 10 in. above the top of the head when all the strings are attached. You will notice that the hand strings are really just one continuous string which passes freely through holes in the forward end of the control bar. This arrangement permits both hands of the puppet to move when the string is pulled as demonstrated in Figs. 8 and 9. The shoulder strings pass through holes in the collar. Note that both eye strings are tied to the bottom bar of the control while the mouth string is tied to the top bar. This is done so the eyes won't open and close each time the legs move. Unlike the hands, the eyes are strung to work independently so that you can make Bozo wink with either eye. Fig. 10 demonstrates how the operator's left hand is held to make Bozo wave and wink while walking along. Note, too, how the knees are raised by tilting the control bar. To make him walk, you tilt the bar first one way and then the other while holding the hand string with the left hand. With a little practice, you'll be able to put Bozo through all sorts of lifelike movements.

The job of making additional puppets to keep Bozo company requires a lot less work since the original plaster-of-paris molds can be used over and over to form all the body members. Each new puppet, of course, requires a different head and here is where you can let your imagination roam. ★ ★ ★



Circled Printing Catches the Eye

Attention will be drawn immediately to rubber-stamp impressions if they are made within a circle stamped in a brighter color. You'll find the rim of an adhesive-tape spool makes an ideal "stamp" for this purpose. The jaws of a paper clamp, held open with a rubber band, will serve as a stamp for adding lines above and below lettering.



Plastic Bag Protects Stored Glue

Even though the cover is replaced tightly, powdered resin glue is subject to hardening in the can, due to atmospheric moisture. However, if the can is placed inside a plastic bag and the excess air removed by pressing the bag around the can before sealing with a pipe cleaner, it has been found the glue will keep dry in the average basement shop.

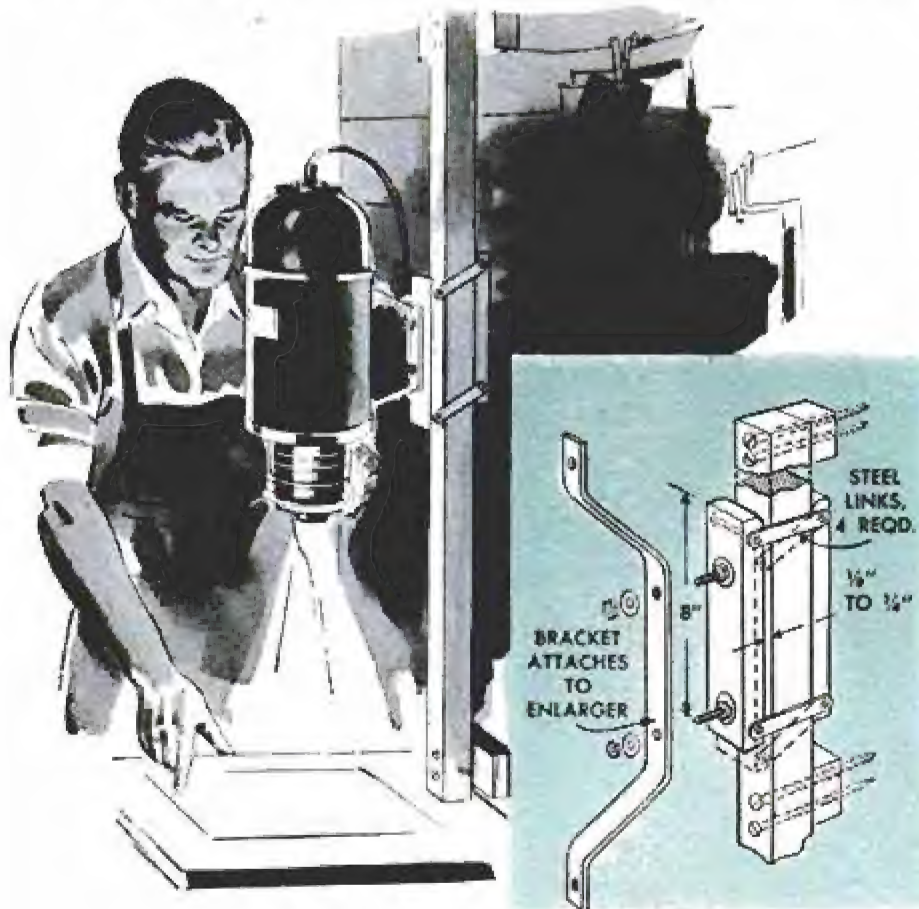
R. Hanscom, Elmhurst, Ill.

Tie Box Makes Neat Brush Case

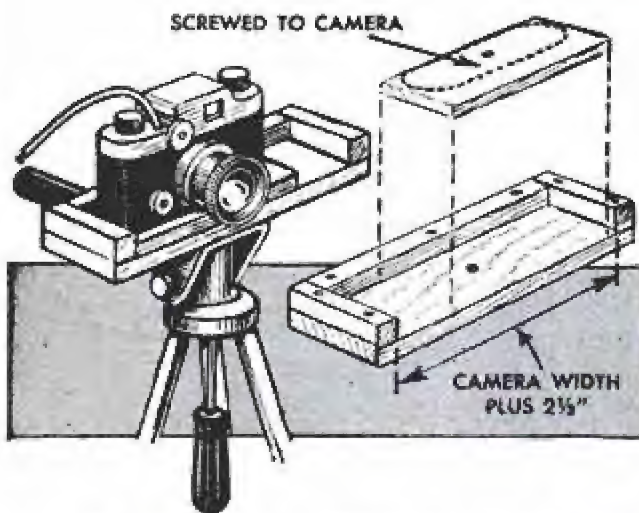
Small artists' brushes can be stored and carried safely in handy cases made from necktie boxes. A strip of elastic is used to hold the brush handles by cutting a series of slots across the bottom of the box and threading the elastic through them. A couple of staples will anchor the ends. In the case of long brushes, the end of the box can be cut so it will fold down and make removal easier. A crimped metal spacer fitted across the box will keep the brushes aligned.



Link Clamp on Homemade Enlarger Permits Quick Adjustment



This simple clamping device for elevating and securing a homemade enlarger on a wooden column is easy to make and permits quick adjustment to the desired height. The clamp consists of two hardwood blocks that are held parallel to each other by four steel links as shown in the detail. When the links are in a horizontal position, the blocks are extended from the column sides, but when the block bearing the weight of the enlarger is dropped below the other block, a jamming action results. For best results, the column must be of uniform thickness for its entire length. The enlarger is bolted to the clamp by means of a steel bracket as shown in the detail.



Holder Permits Taking Stereo Pictures With 35-mm. Camera

You can take pairs of pictures with your 35-mm. camera for stereoscopic viewing by using this wooden holder mounted on a tripod. First, a picture is snapped with the camera on the right side of the holder. Next, the camera is shifted to the other side of the holder and a second picture of the same subject is taken. Of course, the subject must be in the same position for both pictures. Pairs of pictures are then mounted in empty stereo slides for viewing. Note holder must be $2\frac{1}{2}$ in. wider than camera.

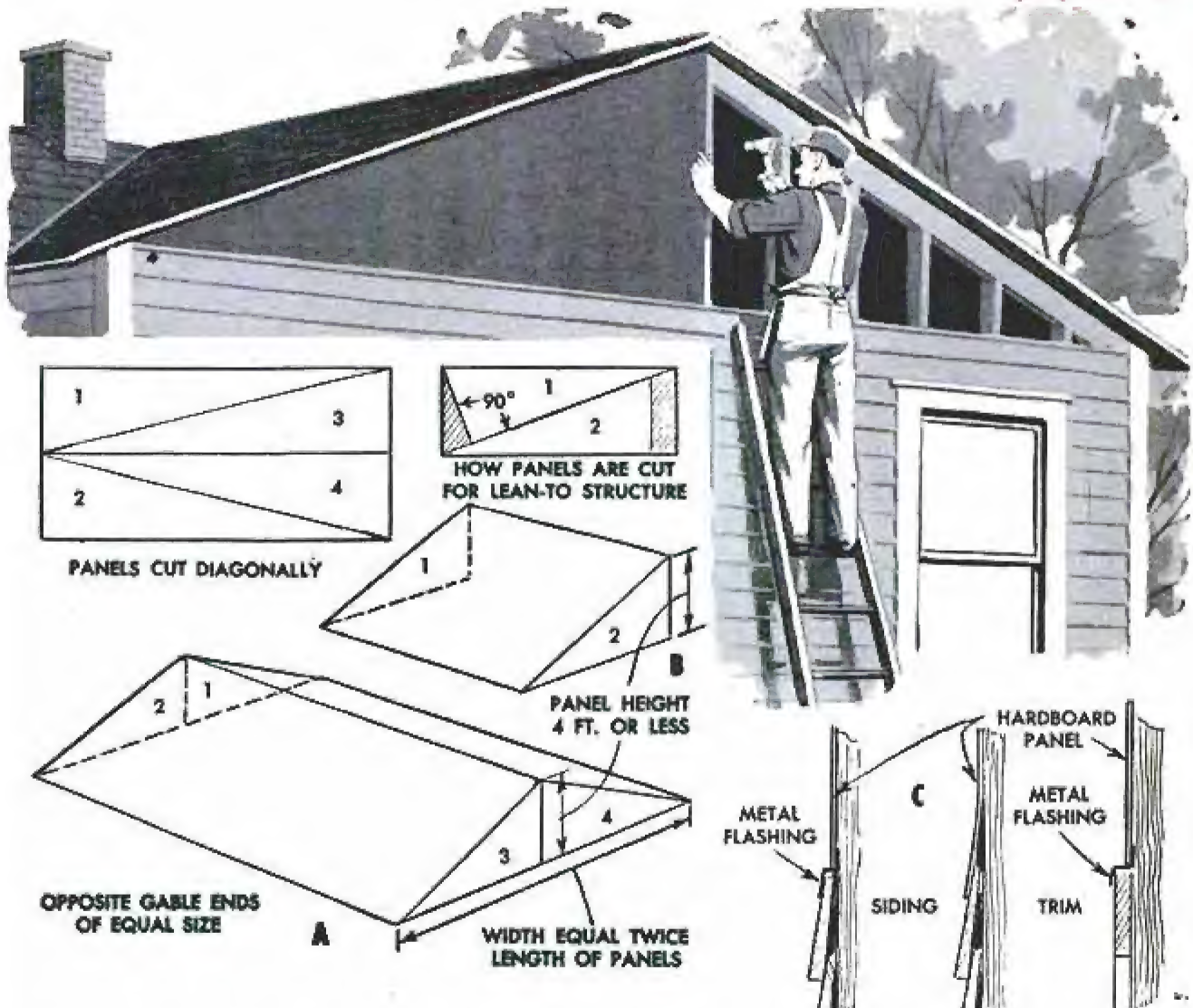


Marble Spacer Under Film Reel Speeds Washing in Tank

More efficient washing of film in a roll-developing tank will result if the film reel is held off the bottom of the tank so water can circulate under it. A glass marble or the tank agitating stick can be used to support the reel.

Virginia Hanson, Los Angeles, Calif.

☛ To reduce wear on the threads of a camera cable release, which are of softer metal than the socket on the shutter, lubricate the threads occasionally with a grease stick or similar heavy lubricant.

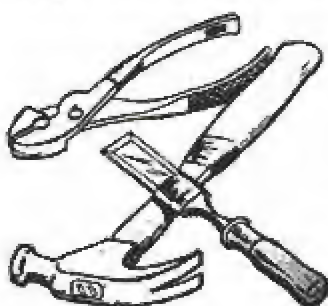


Hardboard Panels at Gables and Ends of Lean-to Porches

Many builders prefer to use panels of hardboard instead of lumber at the gable ends of ranch-type houses and lean-to structures such as porches. Besides being strong, durable and attractive, the panels can be applied at considerable saving of time. Where opposite gable ends are the same size, both often can be covered with two panels of hardboard about half as long as the gables. Each panel is cut diagonally, upper left-hand detail, and the four sections then are arranged as in detail A, so that the smooth surfaces will face the outside. Ends of a lean-to porch can be en-

closed in a similar manner with a single panel, cut as shown in the upper, right-hand detail. The panel should be slightly longer than the space to be covered. By cutting it as shown, allowing some waste at the ends, the pieces can be arranged so the smooth surfaces will face the outside. In this case, the maximum panel height will be a few inches less than 4 ft. Where panels butt together over studs, vertical joints can be sealed with calking compound or covered with strips of wood or metal. Lower edges of panels should be flashed or overlapped as shown in detail C to shed rain.

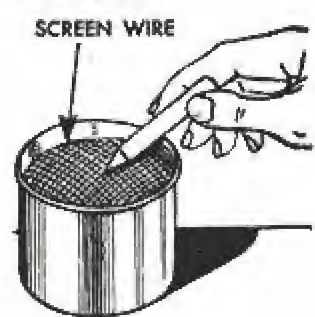
Tape Identifies Borrowed Tools



When either loaning or borrowing tools, mark each item with a strip of adhesive tape. The tape will remind the user that the tool is borrowed and should be returned.

Sharpener for Chalk Sticks

Sharpen chalk sticks for close marking by using a "sharpener" consisting of a tin can in which is inserted a dome shaped disk of screen wire. Chalk dust falls inside.



GOLF CART-RUNABOUT

PART II

By Tom Riley



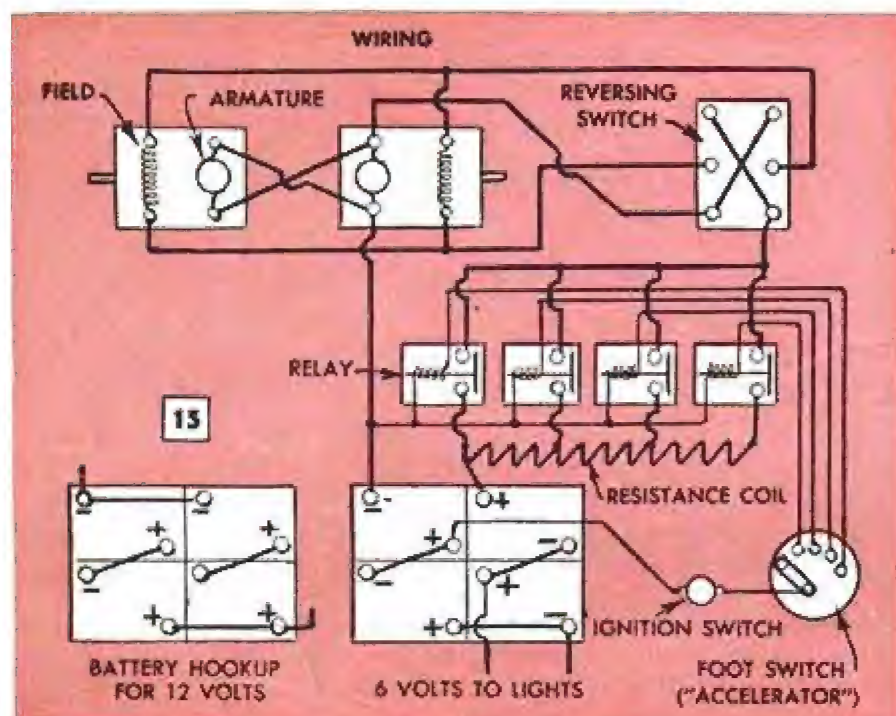
14

AFTER COMPLETING the main frame, drive-unit frame and all other work described in Part I last month, the next step in construction of the cart is installation of the batteries. Heavy-duty, 6-volt batteries rated at 170-amp. hours or better should be used to assure maximum performance. Batteries having bolt-on connecting posts are the best for installation in the cart, as they allow interconnection of the batteries with inexpensive "bus bars" of $\frac{1}{8}$ x $\frac{3}{4}$ -in. aluminum flats, Fig. 19. Screw strips of $\frac{3}{4}$ x $\frac{3}{4}$ -in. hardwood to the floorboard

around the batteries to keep them in place. Batteries shown in Fig. 19 are standard-sized, grouped in a rectangle and centered in the cart. If long, narrow batteries are used, place them four in a row across the center of the seat space. Weld a frame of $\frac{3}{4}$ -in. steel angles for a hold-down and secure this frame on two ends by means of long $\frac{1}{8}$ -in. bolts passed through the floorboard. This arrangement is similar to that used to hold the battery in an automobile. The lower, left-hand detail in Fig. 15 shows how four 6-volt batteries can be hooked

together for 12 volts, the detail to the right shows a 24-volt hookup. Note the 6-volt take-off for lights. If the cart is used on the street, it will require a horn and lights as well as a license. When extra accessories are installed, tap each unit from a different battery. This distributes the electrical drain so that one battery is not overtaxed. Because the batteries are charged as a unit, when the other three were fully charged, the battery from which all the accessories were draining still would not be up to standard.

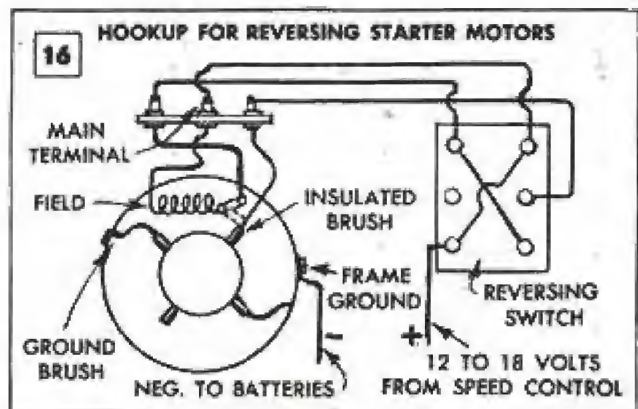
Next, it is necessary to determine the method to



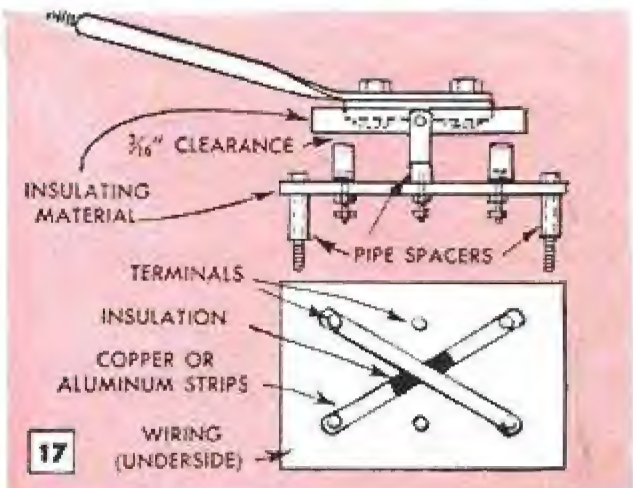
13

use for reversing the motors you are going to use. Most traction motors have 3 or 4 terminals on the outside, with a diagram printed on the motor or terminal box, so no changes are necessary in this type of motor. Most surplus aircraft motors will require that short leads be run through the brush cover to extra terminals on an insulated base outside the motor, as shown in Fig. 16. Reversing diagrams sometimes are supplied with these surplus motors, but it is best to have an electrician check to make sure it is right. A diagram supplied with motors used on the original cart was incorrect; it recommended reversing the polarity of the brushes, resulting in a dead short, because these particular motors had grounded armatures. Fig. 16 shows how these were correctly reversed. It still is best to check with an electrician before connecting your motors.

The heavy-duty reversing switch required, Figs. 17 and 21, is obtained inexpensively by rebuilding an old-style 50 to 100-amp. double-pole, double-throw service entrance switch. They can be obtained at some electricians' shops because they are being replaced in homes today with less exposed disconnects. Raise the two center, or hinge, jaws of the switch about $\frac{3}{4}$ in. on pipe spacers, so the blades will clear the end jaws by $\frac{3}{16}$ in. when they are level, Fig. 17. Replace the two blades and handle with two 5-in.-long copper blades, pivoted at the middle. Bolt a block of insulating material between the blades at the center, then attach a new handle. If necessary, reposition the four outer jaws on the base plate so they fit under the new blades. Bolts securing all six jaws to the base should extend about $\frac{3}{4}$ in. below it, so they

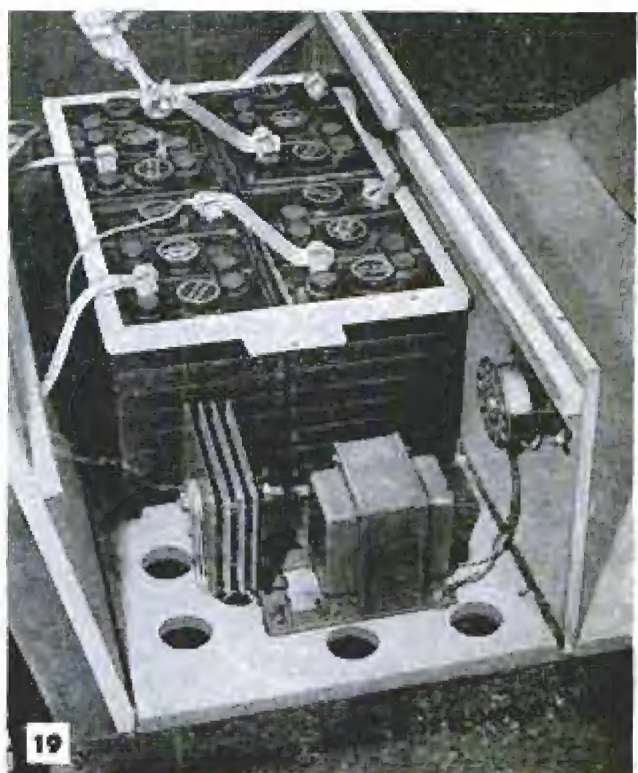
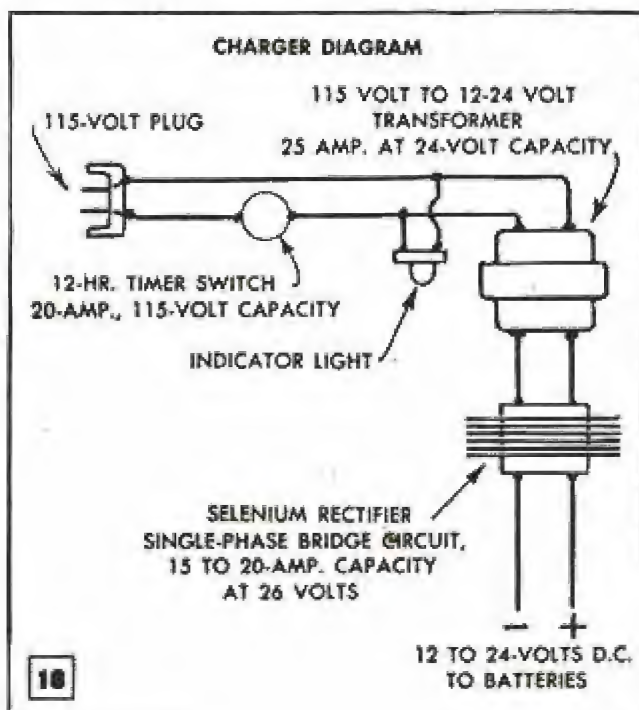


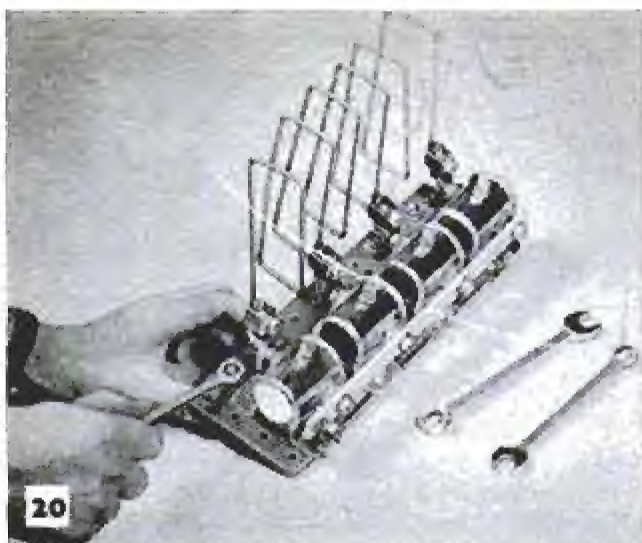
Above, wiring diagram for reversing aircraft starter motors as corrected by builder of original cart. It still is best to have electrician check motors



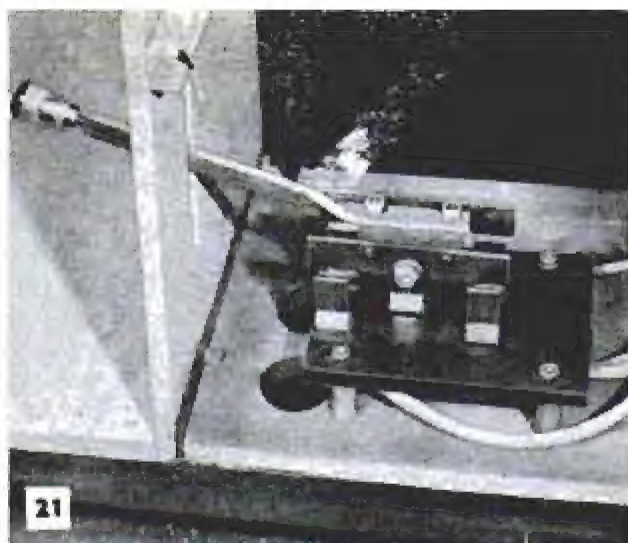
Reversing switch for cart, above, is made by modifying switch used originally in house wiring. They sometimes can be obtained at an electrician's shop

Photo, below, shows installation of four, 6-volt batteries, with hold-down frame. Charger and timer are in foreground. Wiring diagram is shown at left

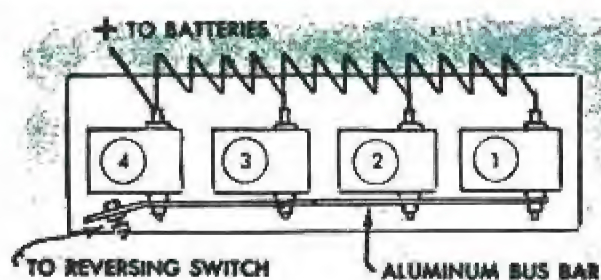




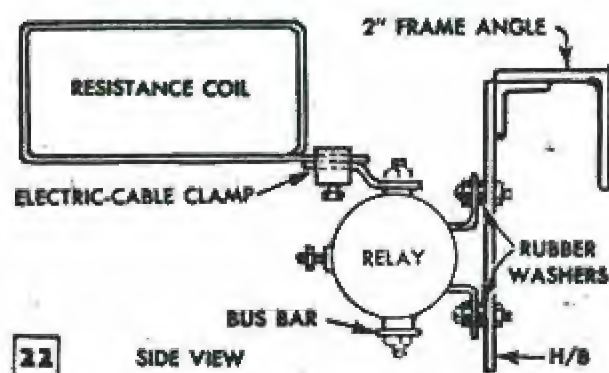
Speed-control unit, above, consists of four auto-starter relays and a rectangular resistance coil



Reversing switch, above, is raised on pipe spacers so that wiring can be run in the space beneath it



SPEED CONTROL



SIDE VIEW

Above, wiring diagram and layout of speed control shows how resistance coil is offset to keep it well below rear deck. Below, hood is marked for cutting

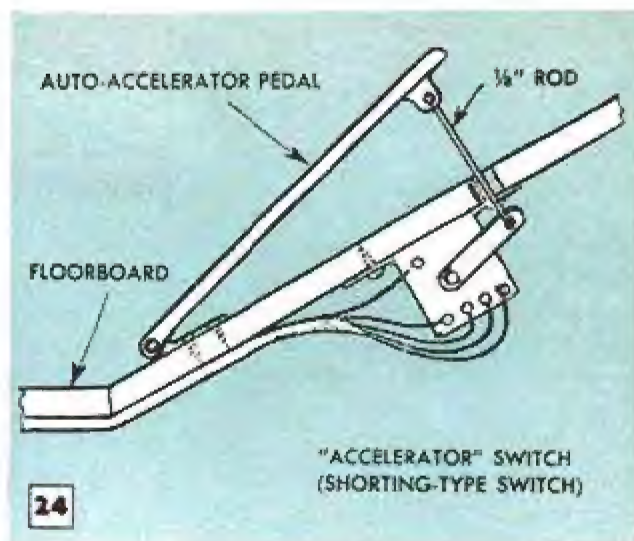


can accommodate two nuts and cable terminals. On the underside of the switch base, cross-connect the four outer terminals as indicated in Fig. 17, using copper or aluminum strips. The switch handle is a $\frac{1}{4} \times \frac{1}{2} \times 10$ -in. steel flat, twisted 90 deg. just beyond the insulating block to which it is bolted. The end is ground down and threaded to accept a small gear-shift knob from an automobile steering-column lever.

To vary the speed of the cart motors, a speed control is assembled from four 6-volt auto-starter relays, which pass the electric current through a varying length of chrome-nickel resistance wire, Figs. 20 and 22. In operation—see Fig. 22—closing relay No. 1 causes the current to pass through the full length of the resistance coil, resulting in low speed. Closing relays 2, 3 and 4 give constantly higher speeds, with No. 4 producing full speed because it allows the current to bypass the resistance coil. Use auto relays that have no connection between the relay coil and its main terminals, such as for a 1946 to 1954 Plymouth. Most Ford relays, for example, look the same, but have the relay coil wired internally to one of the main terminals, which will cause the 12 to 24-volt current to feed back through the 6-volt coils, causing either a heavy “short” or chattering of the relays. If available, 24-volt aircraft relays, which have silver contacts, are best. Drill holes 3 in. apart in a $\frac{1}{8} \times \frac{3}{4} \times 11$ -in. aluminum bar and bolt the motor-side terminals of the relays to it. Bolt the four relays to a 4 x 12-in. piece of $\frac{1}{4}$ -in. hardboard, using rubber washers as indicated in the lower detail, Fig. 22, to quiet the click when they operate. Connect the four relay housings together with a small wire to provide a 6-volt ground. Making the resistance coil is a cut-and-try matter, depending on the wire, motor type and voltage used. Try about 10 ft. of

$\frac{1}{8}$ -in.-dia. chrome-nickel resistance wire, wrapped around a 2 x 6 to form a rectangular coil. Because the wire gets hot when the cart is running, mount the coil above the relays, and extending out from them as in Fig. 22. For the same reason, connect the coil to the relays with electric service-entrance cable clamps, rather than by looping the wire around the relay terminals. The clamps also allow you to tap off anywhere along the coil. Connect the clamps so there is more coil between relays 1 and 2, than between the others. If this produces too slow a first speed, cut down on the length, if too fast, add more resistance wire between the first two relays. The speed control is bolted to the center of the 2-in.-angle crossframe with two pieces of steel angle, Fig. 22.

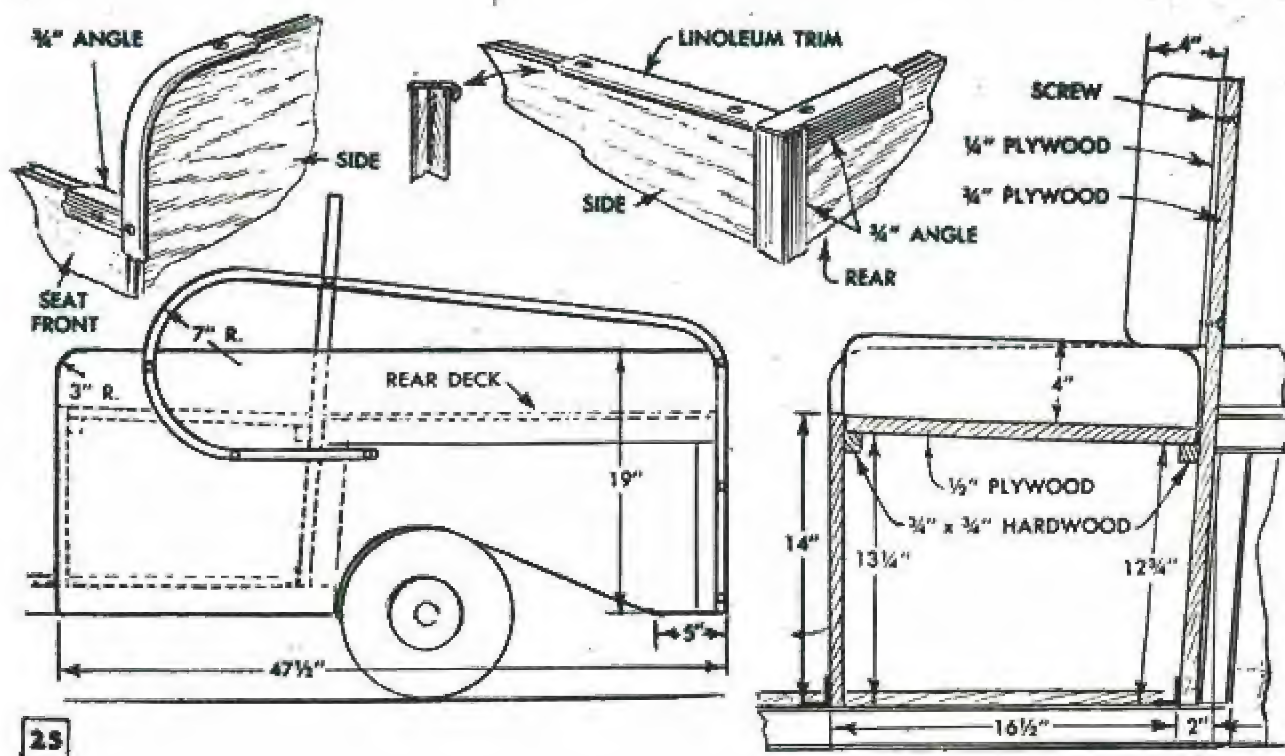
The 6-volt wire from the batteries and the four wires from the relays to the "accelerator pedal" need be only 18-ga. stranded wire, secured to the underside of the floorboards. On the original cart, the accelerator switch, Fig. 24, was a long-wearing, silver-contact type made especially for this purpose by one of the larger golf-cart manufacturers. Some heavy-duty surplus radio switches also can be used. They are a "shorting type" switch. The wiper arm of the switch contacts each following terminals before disconnecting from the preceding terminal, providing a smooth action. The heavy wiring from the batteries to the speed control, reversing switch and motors, Fig. 15, should be 6 ga. or heavier. Auto-battery cable is excellent but expensive. House-service cable can be used, but is less



satisfactory because it is difficult to bend at sharp angles.

The built-in charger is an optional feature, but it definitely simplifies servicing. The charger shown in Fig. 19 produces more than 20 amps. at 24 volts, and has both a 12 and 24-volt output. An 18-volt transformer would have to be used, if that current were used in your cart. Mount the transformer on brackets about $\frac{1}{2}$ in. above the floorboard, so wiring can be located beneath it. A 12-hour, spring-wound timer switch, such as used for large fans, is mounted under the seat. The wiring diagram is shown in Fig. 18.

Figs. 14 and 25 show how the two sides, rear panel and rear deck, cut from $\frac{1}{2}$ -in. plywood are attached and trimmed with linoleum trim strips and steel angles. The side rails on the rear of the cart are bent



from 1/2-in. thin-wall electrical tubing. The hood of the cart is formed from a single sheet of 1/8-in. hardboard, measuring 24, x 76 in. Cut this panel after it has been clamped or screwed to the center of the floorboard, with about 5 in. extending below it. Then bend and clamp the ends of the hardboard to the frame. Push it down until the top end assumes an even curve, then screw it to the floorboard every 8 in. Now, mark the vertical lines of the doorway and any pleasing curve desired for the top and bottom edges of the hood, Fig. 23. Remove the hood and cut it with a bandsaw, or cut it in place with a handsaw. The glove, or package, shelf, shown in the photos in Part I of this article, is cut from 1/2 or 3/4-in. plywood and screwed to the inside of the hood at a convenient height. An instrument panel is screwed to the glove shelf at about a 10-deg. angle. Install a keyed "ignition" switch and any other accessories desired on the panel. The hand-brake lever is fastened to the underside of the glove shelf with a metal bracket.

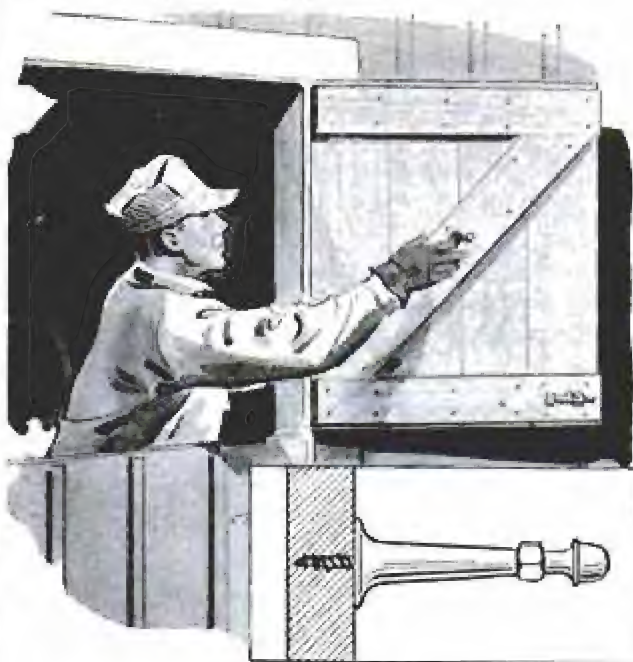
Upholstering of the seat cushion and back may be done by a professional, or at home, if a heavy-duty sewing machine is available. The cover material of the seat should be weather-resistant plastic, and the filling should be two 2-in. layers of foam rubber cemented together. The seat cushion is assembled around a sheet of 1/2-in. plywood, the completed cushion resting on hardwood strips, right-hand detail, Fig. 25.

Note that the seat cushion is slanted slightly, to provide more comfortable seating. The degree of slant will vary, depending on the necessary clearance above the batteries being used. Drill a few holes in the bottom of the seat cushion to provide air escapes for the filling. The seat back is formed in the same manner as the cushion, except that it is assembled on a sheet of 1/4-in. plywood. The completed back then is screwed permanently to the seat back. It is necessary to have the seat cushion removable to permit access to the batteries.

The completed cart can be painted with any enamel, lacquer or other exterior-type finish. The original cart was finished with a vinyl-lacquer, two-color "spatter" paint, that has the advantage of producing a tough, heavy finish in one coat, and does not require a spray gun for application. Rubber floor matting, obtainable at most auto-supply stores, is used to cover the rear deck, floorboards and glove shelf. Metal enamel should be used on the wheels, rails and steering column of the cart.

If the cart is to be used for golfing, two lengths of web strapping are screwed to the top edge of the seat back. The golf bags then can be strapped in place. ★ ★ ★

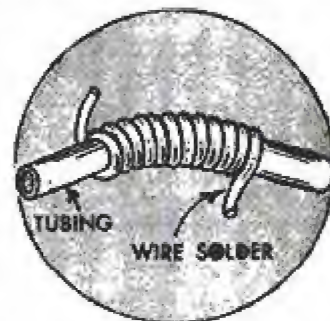
Easier Door Closing Assured With Stop on Upper Half



Less effort is required to close the upper half of a double barn door from the inside when a doorstop is attached to it as a handle. The stop provides added leverage and is easily gripped.

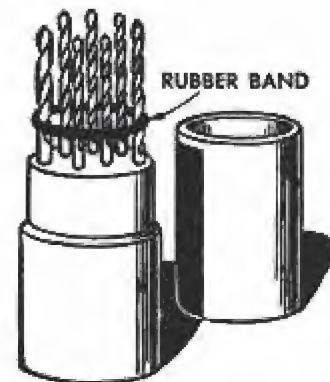
Solder Used as "Tubing Bender"

Bends of fairly short radius can be made in tubing without kinking it if wire solder first is wrapped snugly around the area where the bend is to be made. The solder is removed after the bend is made. Use wire of fairly large diameter, as the smaller diameter solder is not sufficiently strong to prevent the tubing from kinking or collapsing.



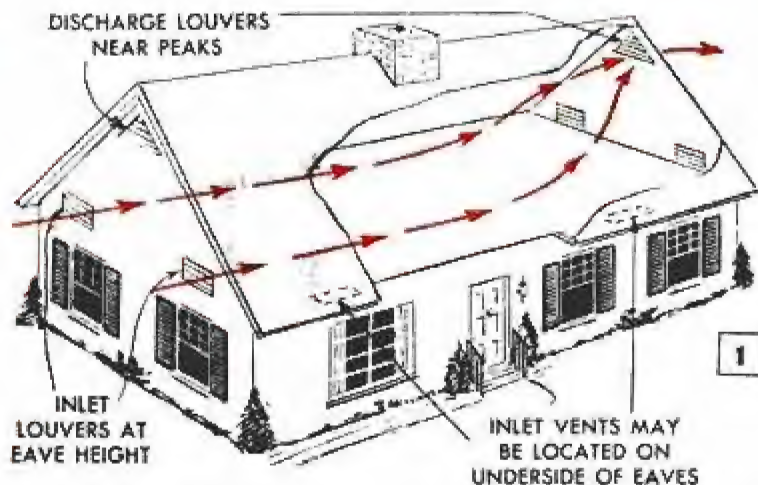
Drill Bits Held in Container

Stretching a rubber band around small drill bits held in a container as shown, prevents the bits from falling out when the container is overturned. This doesn't interfere with replacing the cover or with removing the drills for use.



VENTS for ATTIC SPACE

By E. R. Haan

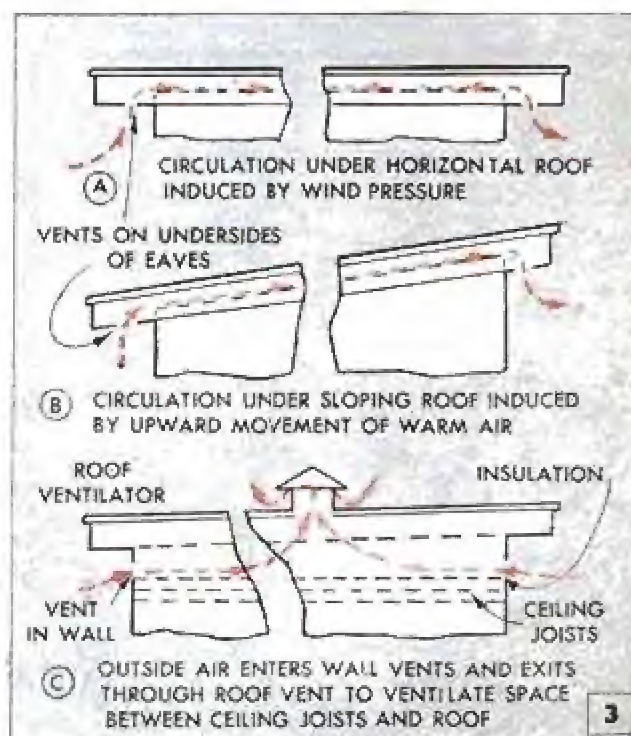
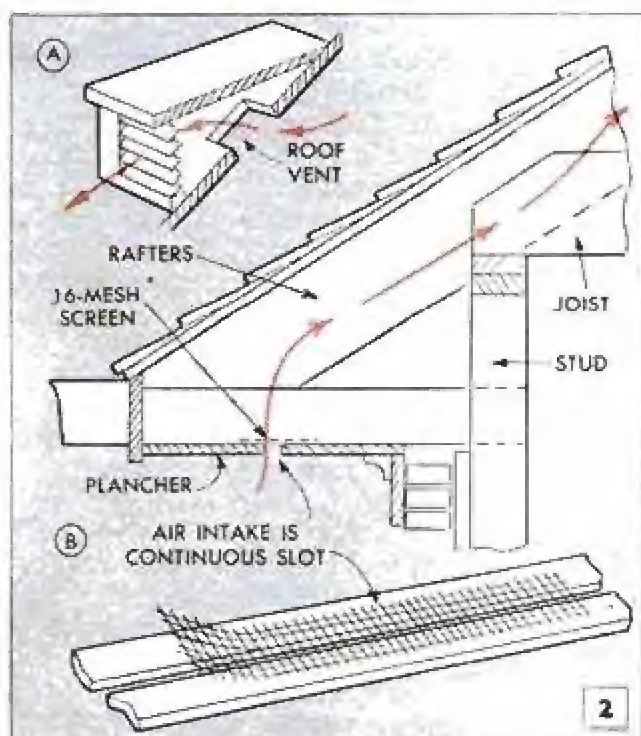


AN IMPORTANT FEATURE of any well-insulated house with an unheated attic or closed space between the ceiling joists and roof rafters is the provision of adequate ventilation for that area. Properly located vents of the required size for the area ventilated provide an escape for hot humid air, help to prevent condensation on the underside of the roof and increase the efficiency of the insulation. Whether your attic space is room-size as in Fig. 1, or so small that it is unusable for storage purposes as in details A, B and C, Fig. 3, there is a type of vent available that will provide excellent cross-ventilation for the space. Any of the vents shown can be installed with the aid of a few hand tools. Standard-size louvers, roof vents, cornice vents and other vents for this purpose are available at most metalwork shops and building-supply stores.

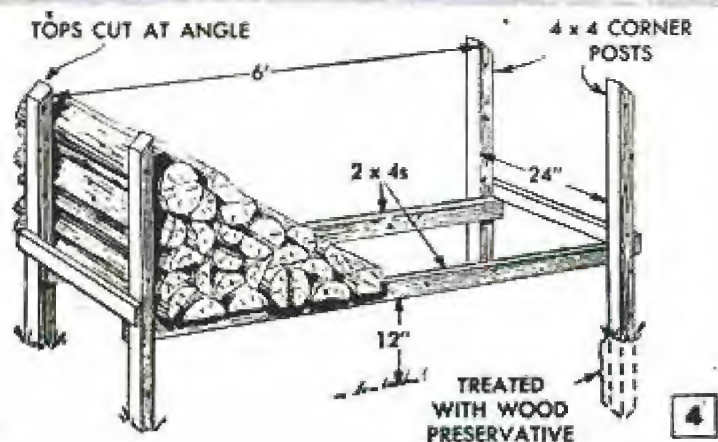
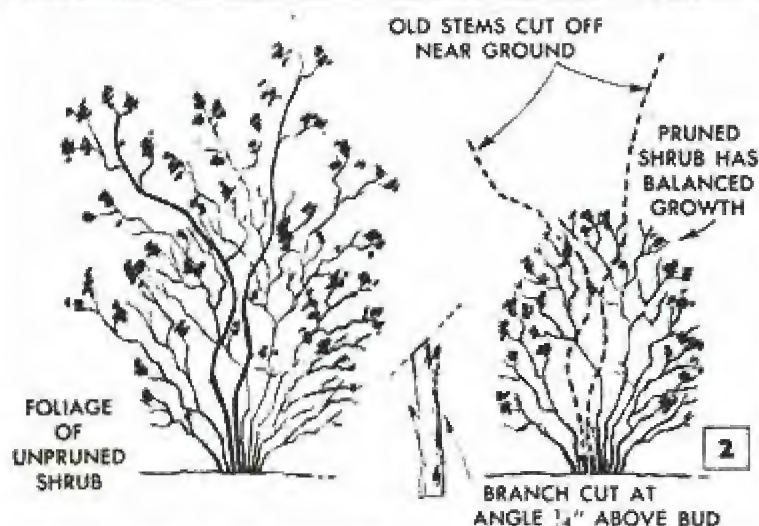
To make intake vents of the type shown in Fig. 2, simply use two boards for the plancher on the underside of each eave and nail them in position to provide a 1/2-in.

slot for the entire eave length. Of course, the strip of screening must be nailed to the inside surfaces of the two-piece plancher board before installing them.

Wall louvers are used on houses with gable ends as shown in Fig. 1. Usually, they are installed in the vertical wall of each gable so that the inlet louvers are located just above eave height and the outlet louvers in or near the peaks. For every 2 sq. ft. of insulated area you will need 1 sq. in. of vent openings. Area of vent openings is doubled in figuring flat-roof buildings. Screening, perforated sheet metal or hardboard are suitable for under-eave applications as shown in detail B, Fig. 2, and details A and B, Fig. 3. A cupola-type vent may be used in combination with wall vents when the roof rafters are separated from the ceiling joists by more than one rafter width as in detail C, Fig. 3. Regardless of the type of vent used, all openings leading to attic space or a closed space must be covered with 16-mesh screening to prevent entry of insects.



X 7 4 9 BACK-YARD



HERE ARE SEVERAL pruning and landscaping hints and several construction projects that can be used to make your back yard more attractive and livable.

To prevent disproportionate growth of most evergreens used as foundation plantings and promote more compact growth, cut back most of the previous season's growth in spring before new shoots start to grow. To correct an unsymmetrical shape, do this only on the filled-out portion, Fig. 1. As a rule, whole branches should not be removed, especially on pines. Spring-blooming shrubs are pruned a week after blossoms fall. Summer-blooming shrubs should be pruned just after flowering. Always prune before seed pods form. Dead or diseased growth should be removed as soon as it is noticed. Don't sheer off tops to reduce height except on shrubs adapted to formal shaping. When shrubs become overgrown, remove some of the old growth at the base, top and sides to encourage new balanced growth as in Fig. 2. Branches should be cut $\frac{1}{4}$ in. above a live bud inclined in the direction in which growth is desired. Long stubs left above buds will decay and invite attack by plant diseases.

Roots of shade trees should be covered with soil up to the bole or trunk. To save a beautiful tree around which the grade must be lowered, a retaining wall of bricks can be built to enclose a generous ground area around the tree as in Fig. 3. If necessary, some interfering roots may be removed leaving enough of the root system intact to sustain tree life and prevent toppling by wind.

If you are bothered with rodents or other animals nesting in fireplace wood piled on the ground, exterminate the animals and then build a rack for the wood as detailed in Fig. 4. The rack can be made as tall and as long as desired, depending upon the amount of wood to be accommodated at one time. To discourage youngsters

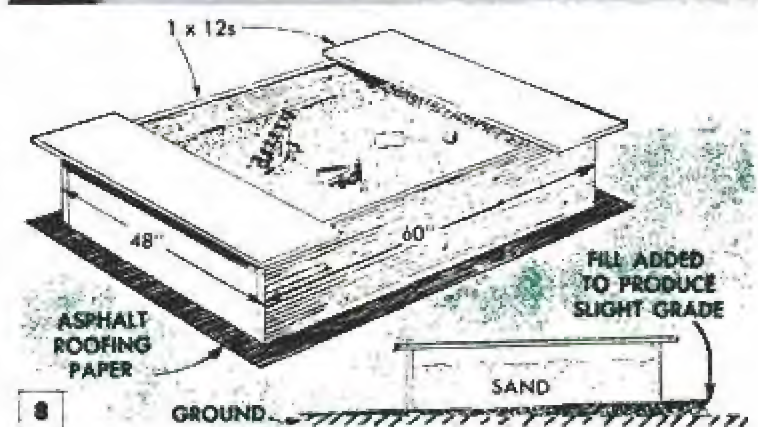
PROJECTS

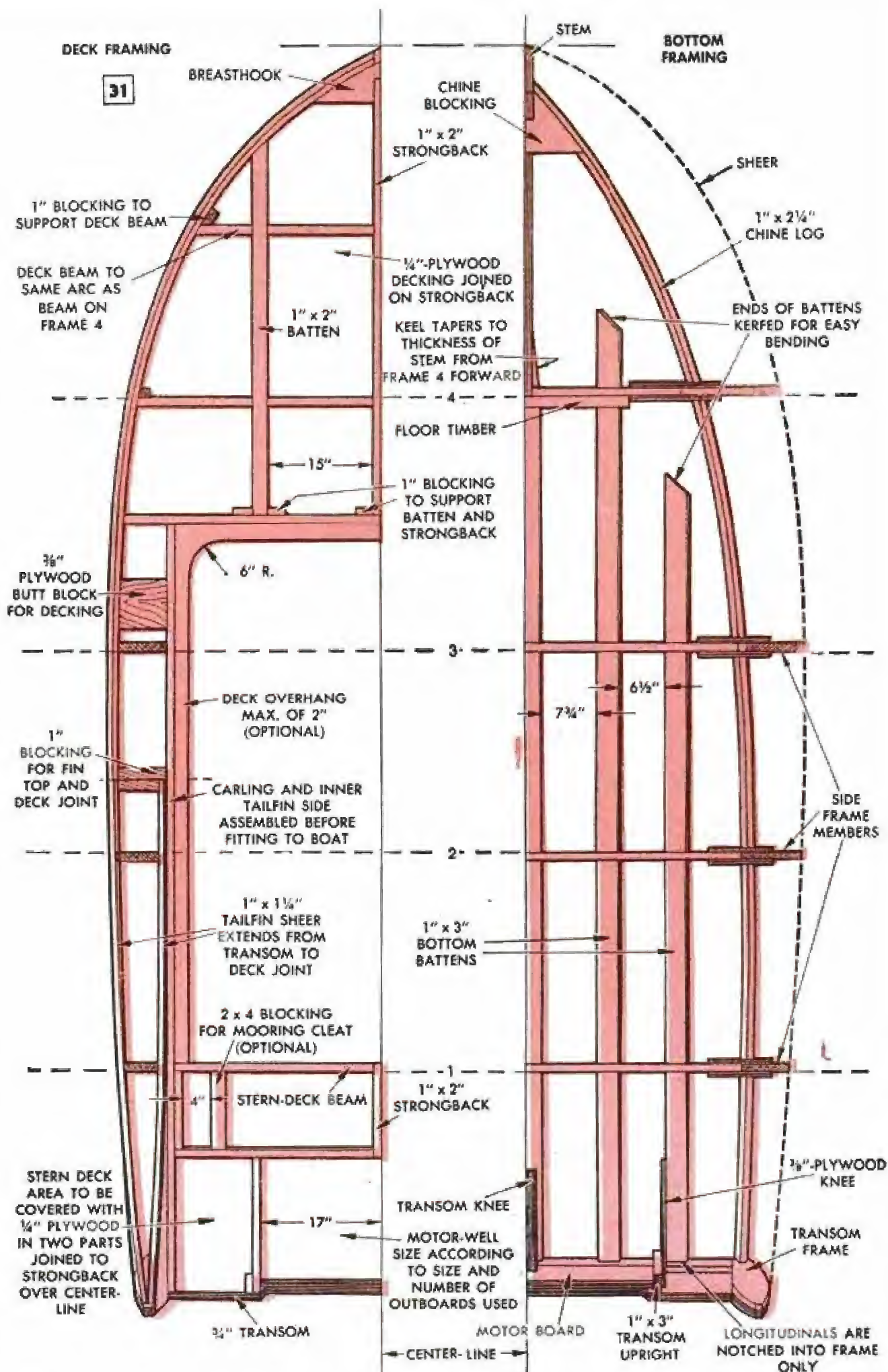
from taking a short-cut path across the lawn to the front entrance of a house situated on a corner lot, an ornamental fence can be erected as in Fig. 5. In the example shown, a lamp on a post at the end of the fence illuminates the driveway and garage entrance.

An attractive trellis, imitation arbor, or gateway provides an excellent means of concealing garbage or trash cans without making them any less accessible as indicated in Fig. 6. The design of the structure used should attract attention to the upper part of it. This can be accomplished by attaching an ornamental object to the top crossrail, such as the small wren house shown. The lower section should have few openings, be hinged for easy access to the cans, and should project a short distance above them. Shrubs on both sides will help to conceal the cans if the trellis or gateway must be located close to a fence corner.

A patio screen that provides shade and affords privacy without appreciably stopping air movement can make your patio a more enjoyable place for relaxation. These requirements can be met by a louver-type screen, such as the one shown in Fig. 7. The supporting posts can be permanently attached to the patio floor, or they can be set in the ground next to it. Any type of barrier will restrict air movement to some extent but a louver screen is least objectionable in this respect. The one shown provides complete shade in late afternoon. For midday shade, panels of translucent glass fiber or other suitable material may be used to provide a roof over part or all of the patio as desired.

Six lengths of 1 x 12-in. pine lumber and a few nails are all you need to make the easily portable sand box shown in Fig. 8. Heavy asphalt roofing paper is used for a bottom which is placed on fill to form a slight grade. This permits rapid drainage of rainwater. When completed the box is given two coats of exterior paint made with a nontoxic pigment. ★ ★ ★







"SWISH"

PART III

By Glen L. Witt, Naval Architect

AFTER APPLYING the primer coats of paint to the outside surfaces of the hull, as explained last month, *Swish* is ready to be turned over and completed. The simplest way of doing this is to unbolt the building form from the floor and turn the entire assembly right side up. Disassemble the building form immediately and use some of the members to block the hull into position.

Deck fairing: The entire deck area should now be faired the same as when the hull members were prepared to receive the planking. Great care must be taken when doing this so that the decking will lie flat to all contacting members. Next, the intermediate deck beam is installed between frame 4 and the breasthook as in Figs. 31 and 36. This beam is cut to the same arc as the beam on frame 4 and is fastened to the sheers and blocking as shown (see fastening schedule, Part I of *Swish*).

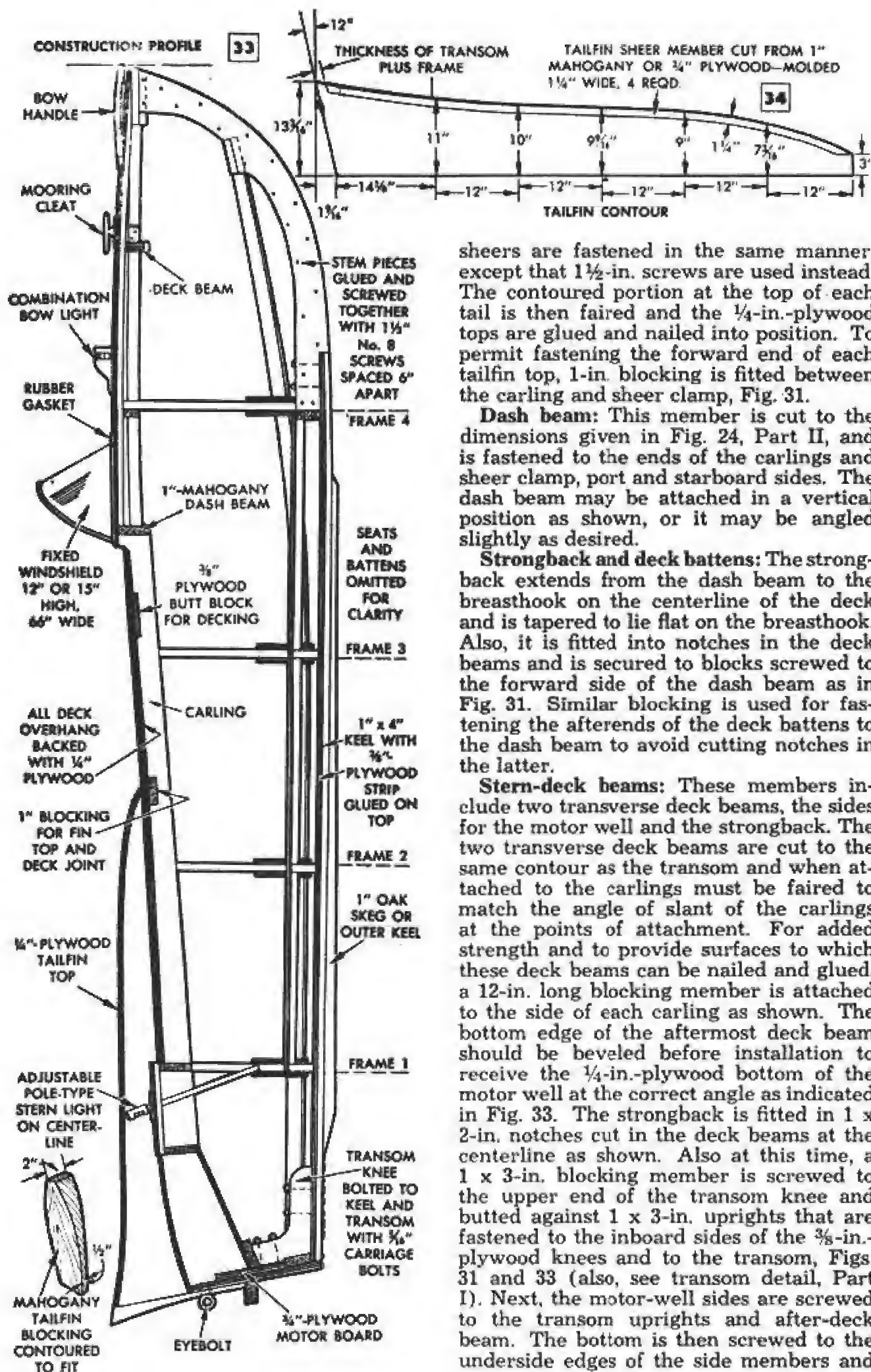
Carlings: The carlings extend from the transom forward to the dash beam. They are cut to shape from the drawing in Fig. 20, Part II. Before installing them, it is necessary to attach the inner tail covering to each which is cut from 1/4-in. plywood according to the dimensions and contours given in Fig. 34. The contoured edges should be left slightly longer than required to allow for fairing later. The carling with inner tail covering attached is then glued and screwed to the notch at frame 3 and to the inside edges of frames 1 and 2 as in Fig. 35. When fitting the carlings, use a chalk line to align them and sand away

contacting edges of the frames or provide shims as necessary so that the sides of these members are perpendicular and parallel to the keel.

Tailfin sheers: The inner and outer tail sheers are the backing members for the junctures of the top and inner planking of the tailfin, respectively. The sheers can be cut from 1-in. solid mahogany or 3/4-in. plywood and shaped as indicated in Fig. 34. A full-size pattern should be made on paper to determine the exact contours of the sheers and both sides of the tailfin planking. The outer sheers are installed first and extend from the transom to 12 in. forward of frame 2 where they are fastened to the sheer clamps, port and starboard. Also, they are fastened to the frames with 2-in. No. 10 screws that are driven through the outer planking as well. The inner tail

Planking edges are planed flush with sheer clamp, and contacting members are faired to receive decking





sheers are fastened in the same manner, except that $1\frac{1}{2}$ -in. screws are used instead. The contoured portion at the top of each tail is then faired and the $\frac{1}{4}$ -in.-plywood tops are glued and nailed into position. To permit fastening the forward end of each tailfin top, 1-in. blocking is fitted between the carling and sheer clamp, Fig. 31.

Dash beam: This member is cut to the dimensions given in Fig. 24, Part II, and is fastened to the ends of the carlings and sheer clamp, port and starboard sides. The dash beam may be attached in a vertical position as shown, or it may be angled slightly as desired.

Strongback and deck battens: The strongback extends from the dash beam to the breasthook on the centerline of the deck and is tapered to lie flat on the breasthook. Also, it is fitted into notches in the deck beams and is secured to blocks screwed to the forward side of the dash beam as in Fig. 31. Similar blocking is used for fastening the afterends of the deck battens to the dash beam to avoid cutting notches in the latter.

Stern-deck beams: These members include two transverse deck beams, the sides for the motor well and the strongback. The two transverse deck beams are cut to the same contour as the transom and when attached to the carlings must be faired to match the angle of slant of the carlings at the points of attachment. For added strength and to provide surfaces to which these deck beams can be nailed and glued, a 12-in. long blocking member is attached to the side of each carling as shown. The bottom edge of the aftermost deck beam should be beveled before installation to receive the $\frac{1}{4}$ -in.-plywood bottom of the motor well at the correct angle as indicated in Fig. 33. The strongback is fitted in 1×2 -in. notches cut in the deck beams at the centerline as shown. Also at this time, a 1×3 -in. blocking member is screwed to the upper end of the transom knee and butted against 1×3 -in. uprights that are fastened to the inboard sides of the $\frac{3}{8}$ -in.-plywood knees and to the transom, Figs. 31 and 33 (also, see transom detail, Part I). Next, the motor-well sides are screwed to the transom uprights and after-deck beam. The bottom is then screwed to the underside edges of the side members and

after-deck beam and to the transverse blocking member on top of the transom knee, Fig. 33. Be sure to coat all mating surfaces with hard-setting glue or mastic to insure watertight joints. If desired, blocking members may be cut from 2 x 4 stock and fastened between the transverse deck beams on the port and starboard sides for attaching mooring cleats. This must be done before applying the decking.

Decking: Mahogany-faced exterior-grade plywood should be used for the deck planking, if it is to be varnished. Fir plywood is suitable for painted or glass-fiber covered decks. The planking for the forward deck is installed in two sections butted together at the centerline on the strong-back. Again, be sure all mating surfaces are properly faired before applying glue and fastening the decking in place. A butt block must be fitted between the carlings and sheer clamps a few inches forward of frame 3 on both sides of the cockpit as

Blocking for stern-deck beams is fitted between beams and marked for cutting upper edge to match carling

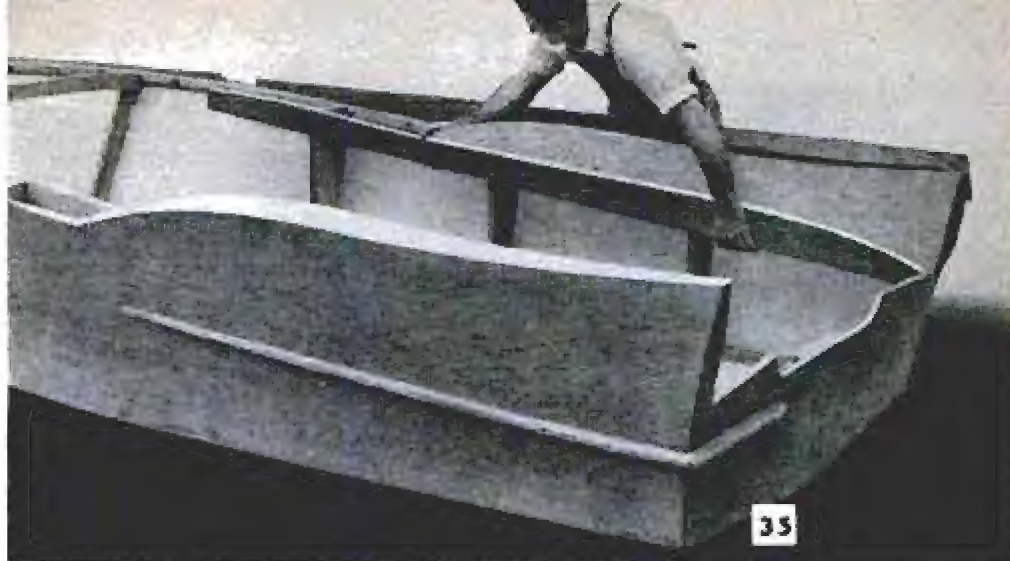
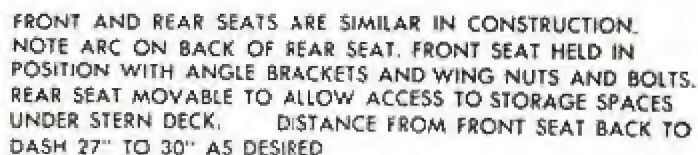


Fig. 35, preassembled carling and inner tail section is positioned in frame notches for fitting. Below, members to receive forward decking are faired





POPULAR MECHANICS

tailfins forward, a 1/2-in. brass or aluminum trim strip should be screwed to the hull, if the latter is not to be covered with glass fiber. This strip acts as a bumper rail, preventing damage to the hull sides when in contact with a dock or other objects higher than the deck. Aft of the tailfins the sheer is reversed, exposing the convex-shaped hull planking to damage at the water line. To prevent such damage, a lower bumper rail is glued and screwed to the planking and frames on each side of the hull as shown in Fig. 37. These rails are cut from 1-in. mahogany and are tapered from a width of 2 in. at the transom to 1 in. at the forward end. These rails should be continued around the transom to form a stern bumper rail as shown.

Painting: After filling all holes and giving the boat a thorough sanding, exterior surfaces to be painted are primed with a good marine primer, followed with at least two coats of marine enamel. The interior surfaces are sealed with a clear-resin sealer before painting to suit. Time and trouble will be saved, if enclosed or semi-enclosed areas are painted or varnished before enclosing them. All areas to be left natural are first filled and stained as desired and then given at least three coats of marine varnish.

Hardware and equipment: For safe handling of your *Swish*, certain fittings and safety equipment must be installed on the boat as shown. To prevent scratching the finish when passengers board the boat from a dock and assure a nonslip footing, step plates are screwed to the side decks next to the front seat. Fittings that permit safe launching and mooring of the boat include a bow handle, forward mooring cleats, bow eyebolt and two stern eyebolts. Lifting rings may be used in place of the latter if desired. All of these fittings, except the step plates, should be through-bolted to structural members, not planking alone.

Safety equipment required, according to

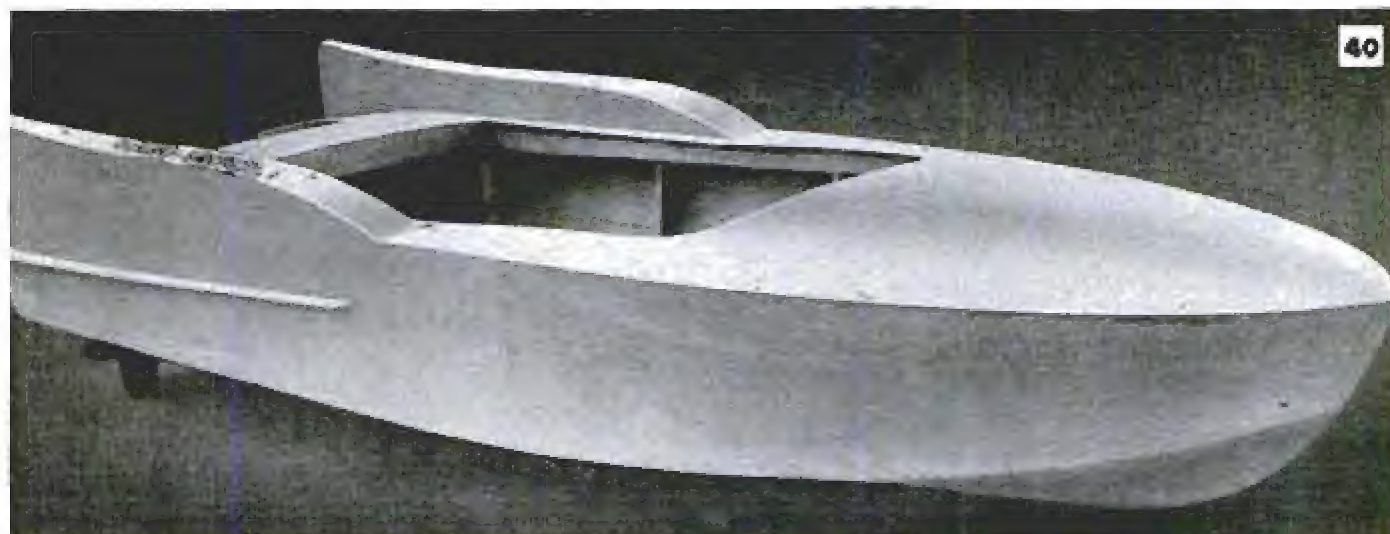
To Save Both Time and Work

If you wish, you can buy the patterns for the stem, frames, transom, breasthook and chine blocking already drawn full size. And, to further simplify construction, you can buy these parts in kit form accurately cut in mahogany from Glen-L Marine Designs, 9152 E. Rosecrans, Bellflower, Calif.

U. S. Coast Guard regulations, include a combination bow light showing red to port and green to starboard that is visible for 1 mile and a white light aft showing all around the horizon, visible for 2 miles. For the latter, an adjustable pole-type light installed as shown on the centerline of the stern deck is recommended. In addition, one Coast Guard approved life preserver, buoyant vest, ring buoy or buoyant cushion for each person on board is required. Outboard motorboats not exceeding 16 ft. in length are not required to be numbered.

Windshield: The windshield shown, is of the fixed Plexiglas type that has a metal-reinforced rubber gasket fitted to its bottom edge for a watertight mounting. Wooden blocks placed on the underside of the deck accommodate the screws that are used for fastening the windshield to the forward deck planking.

Reinforcing tailfins: If the hull is not to be covered with glass fiber, it is advisable to apply glass-fiber tape on all joints on the tailfins and motor well. When properly applied, the tape will prevent leaks at these joints, prevent checking of the paint due to stresses built up by motor vibration and reduce maintenance problems. The tape used should be of sufficient width to overlap a joint by at least 2 in. on each side. The top surfaces of the tailfins also should be covered, using a single strip of glass-fiber cloth for each fin. Cut these strips to provide an overlap of 2 in. for all side joints, and apply several coats of epoxy resin on top of the cloth to completely conceal the mesh. ★ ★ ★





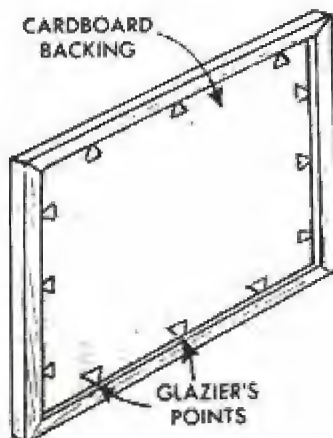
Glue Mixed With Water Colors Improves Photo Spotting

When spotting glossy photoprints with water colors, pass the brush over the glue on the flap of an envelope and pick up some of the glue. The glue assures smoother application of the colors and better adhesion. When dry, the spotted areas will have a gloss.—E. M. Hanson, Los Angeles, Calif.

Fence Posts Pull Easily When Vented With Pipe

Natural suction often makes it difficult to pull fence posts from soggy soil. Here's a stunt you can use. First take a length of $\frac{1}{2}$ -in. pipe, and close off one end. Then drill five or six holes in a row in the pipe below the cap. Now drive the closed end of the pipe into the ground alongside and against the fence post. This will admit air which will relieve the vacuum and allow the post to be pulled out easily.

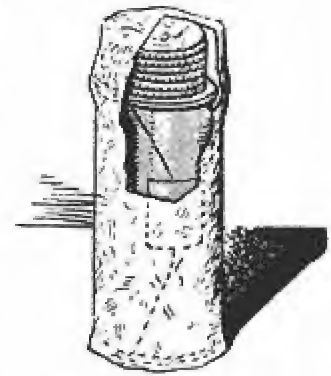
Holding Picture in Frame



Instead of driving brads or small nails into a picture frame to hold the cardboard back in place, use glazier's points. The sharp points are pressed into the frame, rather than tapped, reducing the chance of cracking the glass.—John Comstock, Wellsboro, Pa.

Coins on End of Film Roll Are Mailed Safely

Coins to cover the cost of developing exposed film can be sent to a commercial laboratory safely and conveniently if they are wrapped on the end of a spool. The coins, which should be no larger than a quarter, are



stacked on the spool and the original foil wrapped tightly around both as shown. Laboratory workers will be able to credit the payment and pass the film along for processing without delay.

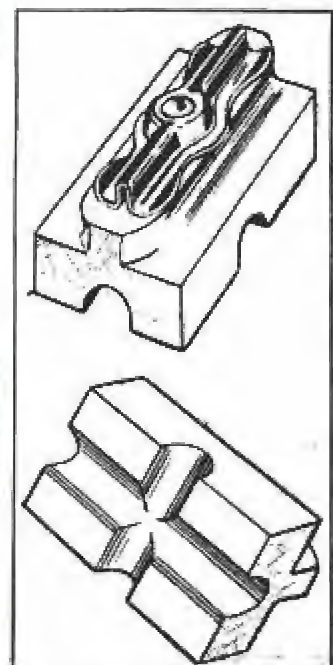
G. E. Hendrickson, Argyle, Wis.

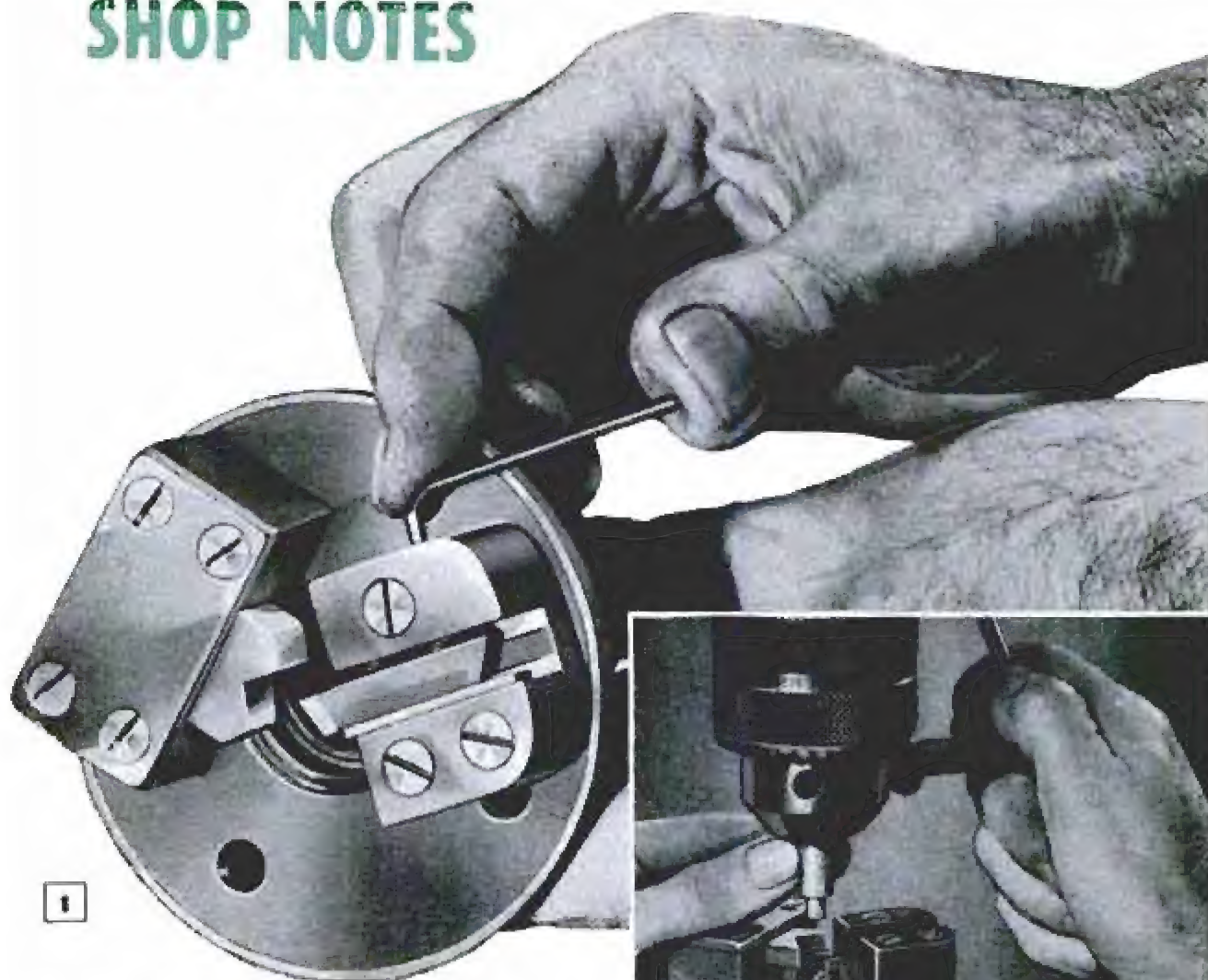
Thinner for Rubber Cement

Rubber cement that has become thickened can be restored to a useful consistency by using lighter fluid as a solvent, when no regular thinner is available.

Photoflood-Clamp Improvement

Spring-type photoflood-reflector clamps are difficult to keep in place on the column of a light stand. To overcome this problem, use pairs of blocks, shaped and grooved as indicated, that spread the clamps farther apart and assure a stronger clamping action. A storm-window turn button is screwed to each block as indicated, so it will remain on the side of the clamp when it is spread to release it from the light-stand column.





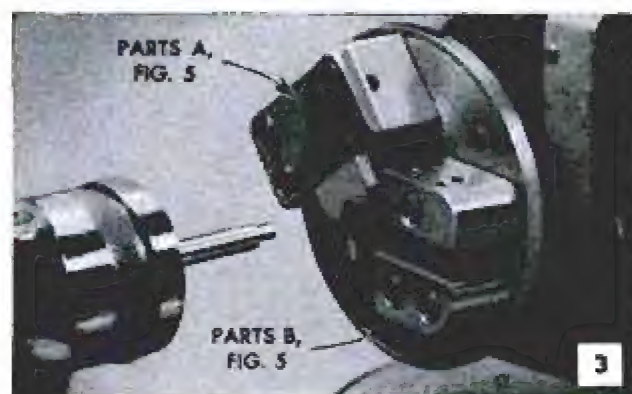
BOX TOOL FOR YOUR LATHE

By Walter E. Burton

SN 59

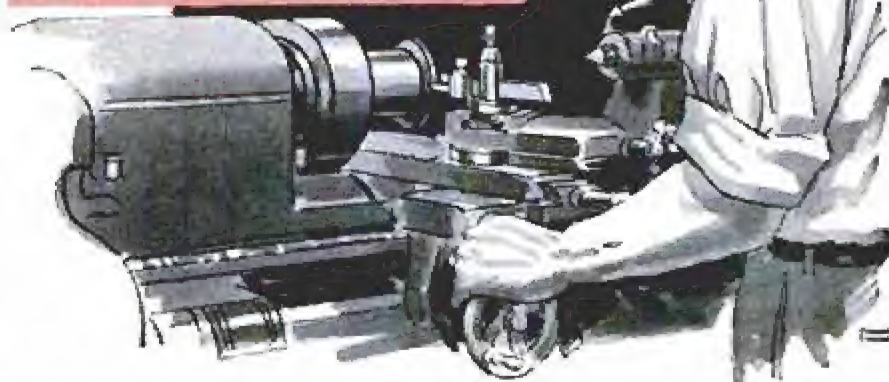
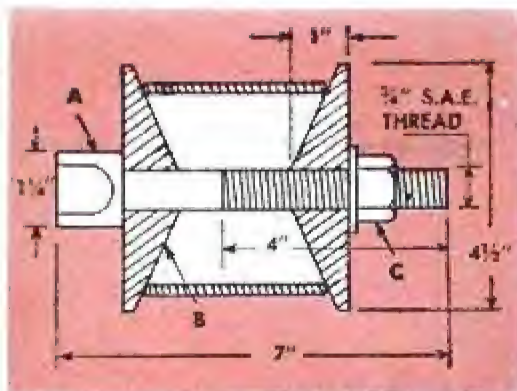
A BOX TOOL, or backrest turning tool, is widely used on turret lathes to speed up multiple operations on duplicate parts. This simplified box tool is designed to be used on the shop lathe or drill press for step turning and shouldering cuts on round stock. It consists of a mounting plate, made by turning down a pipe floor flange, Fig. 4, and two adjustable holders, one for the turning tool and one for the backrest, Fig. 1.

Fig. 2 pictures the unit in use on the drill press and Fig. 3 shows it mounted on a lathe milling attachment, the work being driven by a collet chuck. Both operations pictured are typical of that on duplicate parts and in both instances the unit is held stationary while the work rotates. The backrest, or V-rest, Fig. 5, usually is made from brass or bronze to prevent scoring the work. Both ends are veed at 90 deg., one vee being made smaller than the other to



Lathe Mandrel Is Adjustable

This mandrel was designed by a machinist especially for holding thin-walled tubing of varying diameter for machining between the ends. It can be driven between centers or with a 3-jaw chuck as desired. The spindle A is shouldered down from the solid stock and threaded to take a nut and washer, C. The flat milled on the big end of the spindle takes the end of the lathe-dog screw when the mandrel is driven between centers. Dimensions only suggest the sizes of the parts. Unit can be made any size.



Grooves in Tip Increase Accuracy of Cutting Torch

Although the aid of a straightedge will assure a more uniform chamfer cut when using an oxy-acetylene cutting torch, it still is difficult to maintain a constant distance between the torch tip and the metal. To overcome this problem, chuck the torch tip in a lathe and cut several shallow grooves around the tapered portion as indicated. The exact depth and number of grooves is not critical. With any one of the grooves riding the corner of the straightedge, it will be found that it is much easier to maintain a constant distance between the torch tip and the

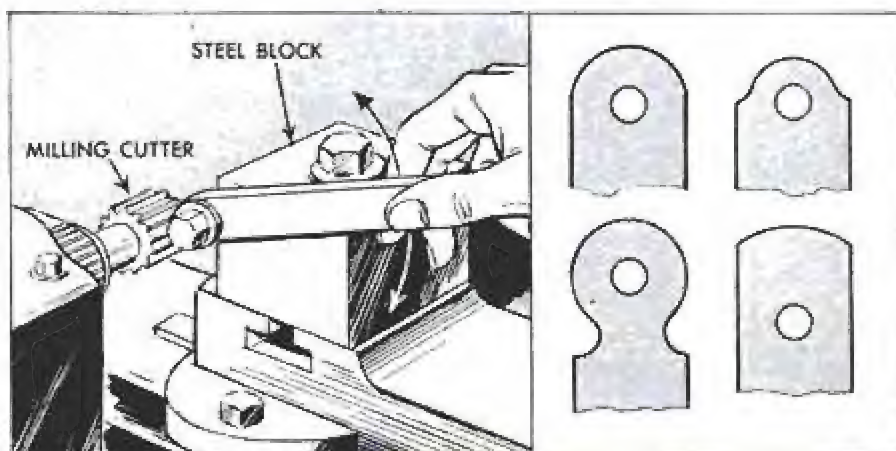


metal, and also to hold the tip at a definite angle for cutting a chamfer.

Andrew Vena, Philadelphia, Pa.

Milling a Radius

Milling a true radius on the ends of precision links is easily done in the lathe with the improvised setup pictured. No sizes of parts are given as the unit must be adapted to the swing of the lathe on which it is used. With a careful setup it is possible to mill any of the shapes shown.—C. W. Woodson, Chicago.





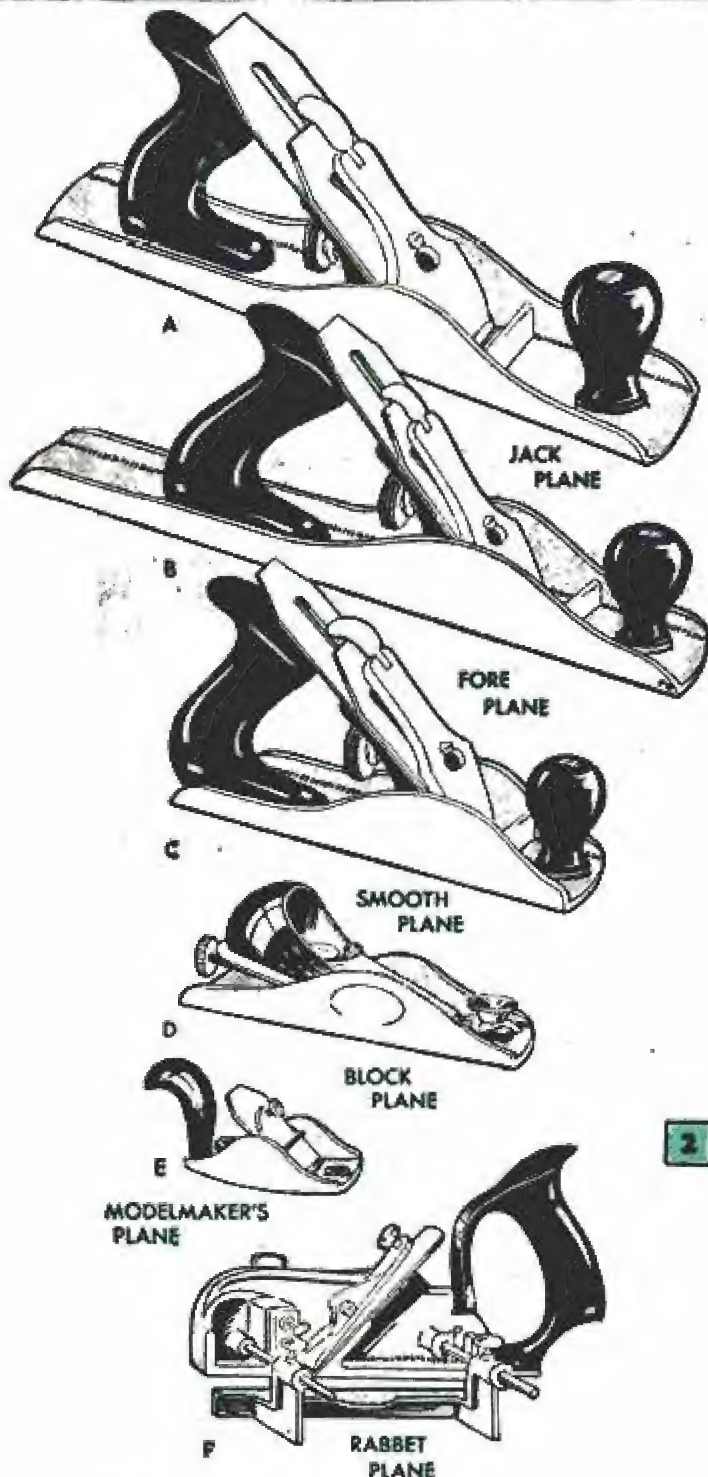
ADJUST PLANE IRON
TO CORRECT DEPTH.
HOLD IN STRONG LIGHT
SO CUTTING EDGE CAN
BE SEEN CLEARLY

DEPTH-
ADJUSTING
NUT

1

By C. W. Woodson

The right plane, correctly
sharpened, set and handled,
will lift ribbon-thin shav-
ings from hard or soft wood,
produce a true, flat surface



A

JACK
PLANE

B

FORE
PLANE

C

SMOOTH
PLANE

D

BLOCK
PLANE

E

MODELMAKER'S
PLANE

F

RABBIT
PLANE



WHEN SURFACING
STOCK, HOLD PLANE
AT ANGLE TO GIVE
SHEAR CUT

3

A—JACK PLANE IS USED TO TRUE EDGES OF ROUGH BOARD AND TO PREPARE SURFACE OF BOARD FOR SMOOTH PLANE OR FORE PLANE

B—FORE PLANE IS USED FOR GENERAL WORK ON BOTH EDGE AND SURFACE OF BOARD

C—SMOOTH PLANE IS COMMONLY USED WHEN NECESSARY TO REDUCE THICKNESS OF BOARD TO ROUGH DIMENSIONS

D—BLOCK PLANE IS GENERALLY USED FOR PLANING END GRAIN AND FOR TRUING SMALL PARTS

E—MODELMAKER'S PLANE HAS ROUND BOTTOM, IS USED IN MAKING SHIP-MODEL HULLS

F—RABBIT PLANE, AS NAME IMPLIES, IS USED IN MAKING RABBETS OF VARIOUS WIDTHS AND DEPTHS WHEN ASSEMBLING CABINETWORK

SKILL WITH A HAND PLANE enables a craftsman in wood to produce a surface on the face or edge of the stock so very smooth and true that it does not require sanding to finish. Excepting those made for specialized purposes, typical hand planes are pictured in Fig. 2, A to F inclusive. Of these the first four, A to D inclusive, are perhaps the most commonly used. The notes above outline the uses to which each plane is adapted.

Carpenters' toolkits usually contain only the jack plane and block plane, while that of the craftsman or repairman may contain



TILTED LEFT



TILTED RIGHT



TOO DEEP

4



CORRECT FOR AVERAGE WORK

ADJUST CUTTING EDGE
OF PLANE IRON PARAL-
LEL WITH BOTTOM.
HOLD IN STRONG LIGHT
SO EDGE CAN BE SEEN CLEARLY

5



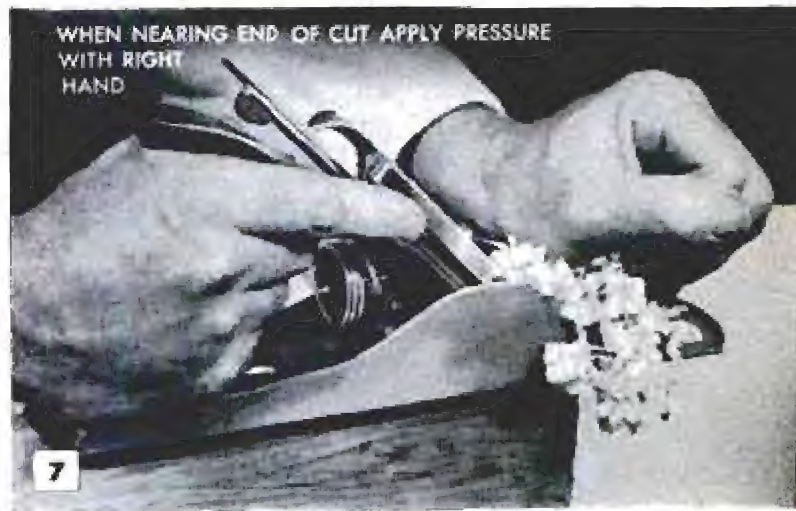
LATERAL
BLADE-
ADJUSTING
LEVER

AT START OF CUT
APPLY PRESSURE
WITH LEFT HAND



6

WHEN NEARING END OF CUT APPLY PRESSURE
WITH RIGHT HAND



7



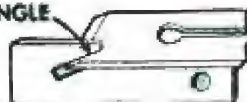
A-HOLLOW GROUND



B-FLAT SEVEL

8

25° ANGLE



REMOVING
WIRE EDGE

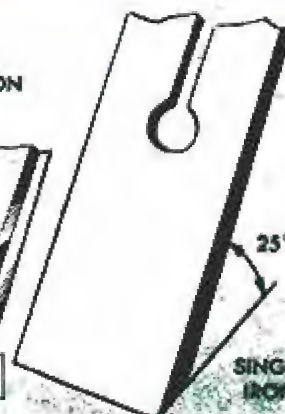
9

CAP IRON



DOUBLE
IRON

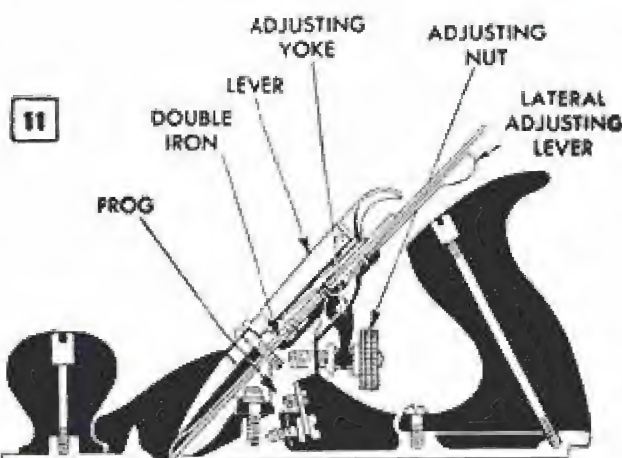
10



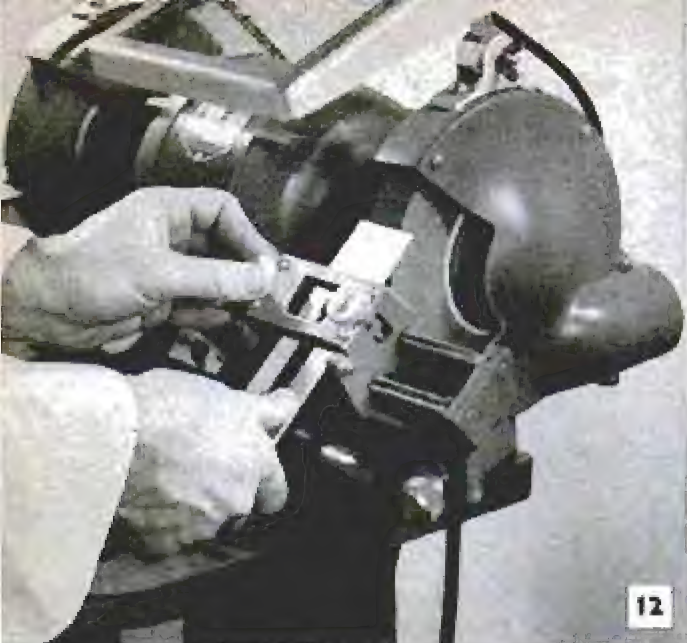
SINGLE
IRON

all those pictured except the modelmaker's plane, which is more or less a specialized tool used by modelmakers and violin-makers for working curved surfaces to a template. In addition to those pictured, carpenters and finishers sometimes select the jointer plane in place of the fore plane, B. The jointer plane is the same general construction as the fore plane except that the frame is longer.

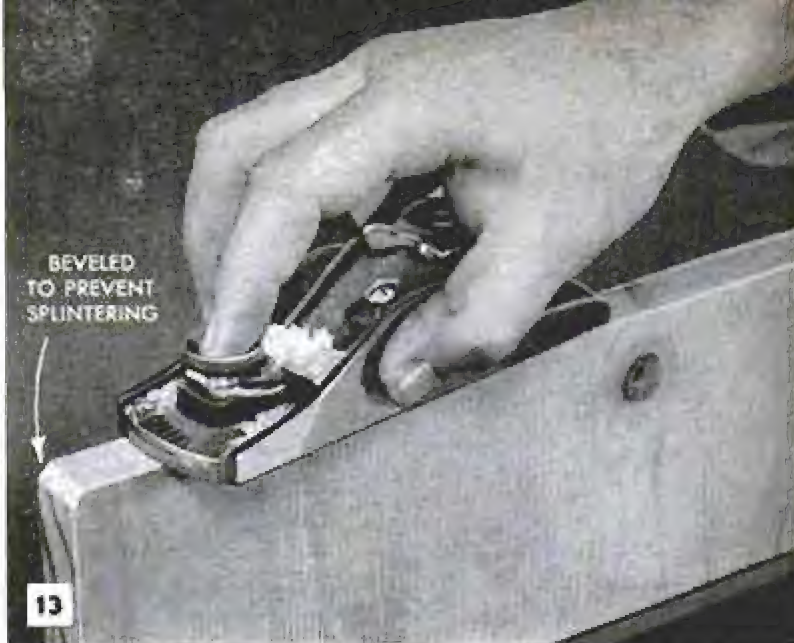
The trick of planing a board smooth and edging it true begins with a sharp plane blade, or iron, as it is called. If you sharpen the iron by hand, you will get a flat bevel,



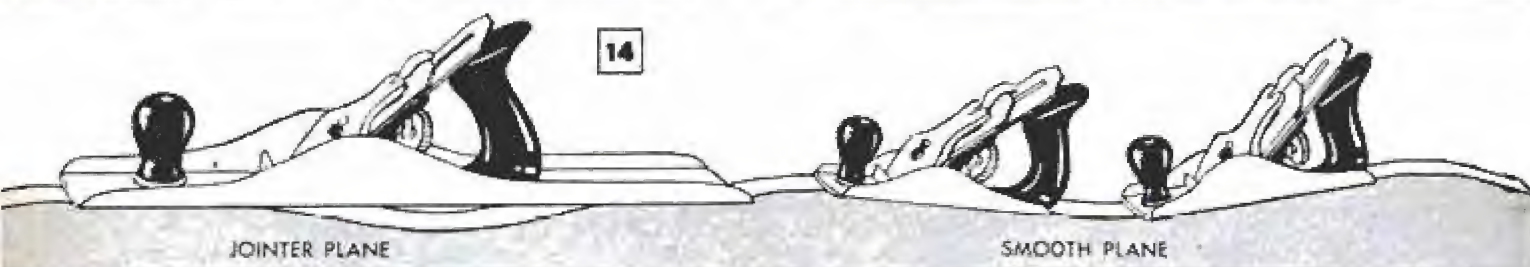
11



12



13



14

B in Fig. 8. The method produces a wire edge which is removed by inverting the iron on the oilstone and giving it a few light, circular strokes. If the blade is sharpened with a grinder attachment as in Fig. 12, the curvature of the wheel will produce a hollow-ground bevel, A in Fig. 8. This is then shortened somewhat by stroking on the oilstone to produce a second flat bevel. The procedure results in a keen edge that will stand up well due to a greater thickness of metal to back up the cutting edge. Ordinarily the bevel is ground to 25 deg., Fig. 10, but some users reduce the bevel to 22½, or even 20 deg., when it is necessary to produce an exceptionally keen edge. A bevel gauge, Fig. 9, is handy to determine the exact bevel, especially when hand sharpening. When sharpening, it's a common practice to form a very narrow bevel (about ⅛ in.) at the corners of the cutting edge. This assures that the plane will not leave a mark, or shoulder, at the edge of the cut when planing a surface. When sharpening the plane iron on a grinder, use extreme care not to heat the edge to the point where the metal changes color. Dip the edge frequently in water or use a vitreous grinding wheel which does not overheat the metal and draw the temper.

Modern hand planes with iron frames usually are fitted with a double iron, Fig. 10. This consists of the single iron, or cutting iron, and the cap iron which serves as a chip breaker. The two are assembled with a special screw and are locked in position

on the frog with the lever as in Fig. 11. For average work the cap iron is set with its lower edge about ⅛ in. above the cutting edge of the single iron, but some users prefer to set the cap iron to less space, especially when planing wood that is cross grained.

The next step is setting the cutting edge of the iron parallel with the bottom, or sole, of the plane and to the correct depth for the type of work to be done. Figs. 1, 4 and 5 show the procedure. The details in Fig. 4 are, of course, greatly exaggerated for purposes of illustration. The blade is tilted right or left with the lateral adjusting lever, Fig. 5, and is raised or lowered with the depth-adjusting nut, Figs. 1 and 11.

When surfacing stock, hold the plane at an angle to give a shear cut as in Fig. 3. When edging, or jointing, stock apply pressure with the left hand at the start of the cut, Fig. 6, and with the right hand when nearing the finish of the cut, Fig. 7. This procedure assures a true edge. The block plane, having a single iron set at a low angle, is especially suited to smoothing end grain, Fig. 13. Bevel the corner of the stock to prevent splintering. It's important to select the right plane for the job. To joint the edge of rough-sawed stock, use a fore plane, or better, a jointer plane rather than a smooth plane. The reason is shown in the exaggerated view in Fig. 14. The smooth plane will follow irregularities, but the jointer plane, having a long frame, will cut down the high spots and produce a true edge.

★ ★ ★

MACHINED PIPE AND FITTINGS

make power-tool frames, welding stands, tripods, telescope mounts, bearing housings and are suitable in any assembly where light weight, rigidity and strength are required

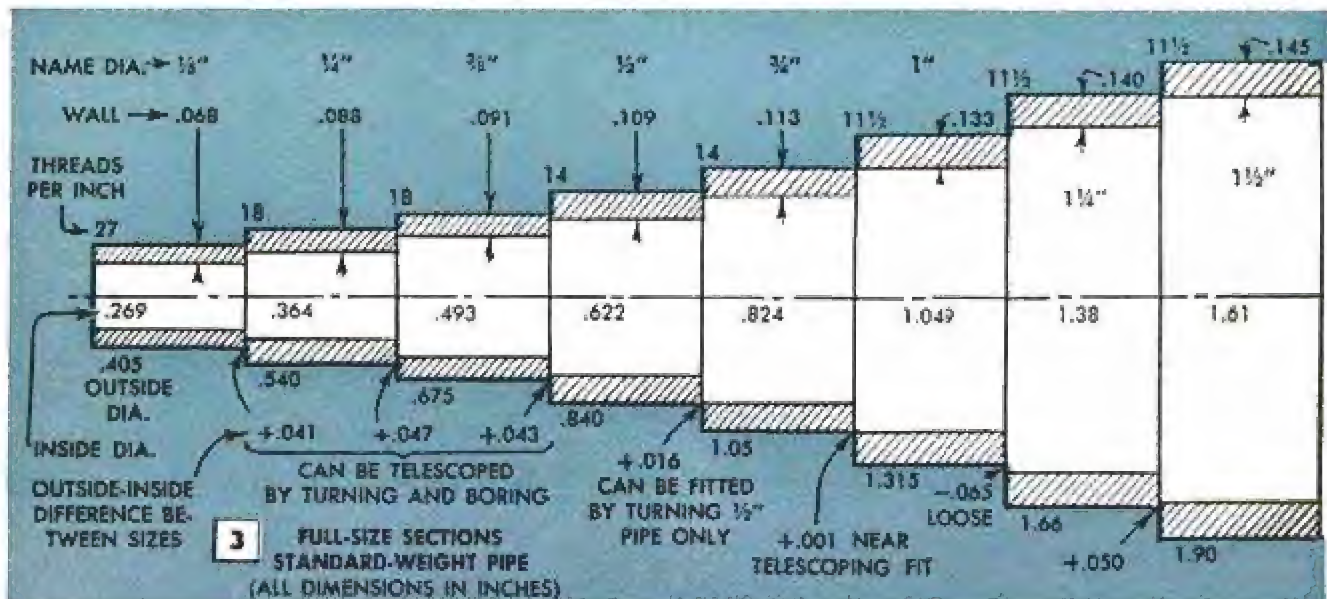
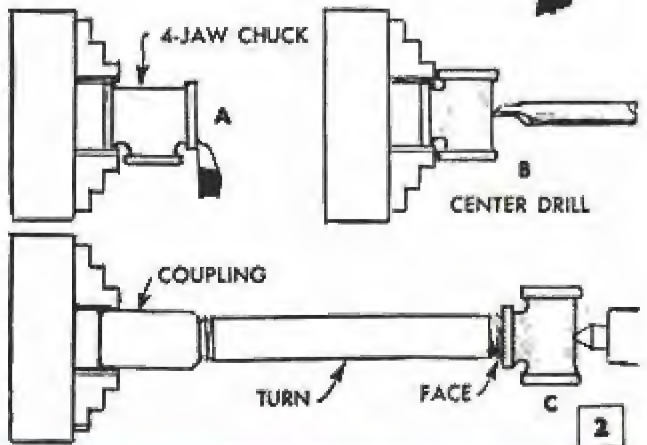
By Sam Brown

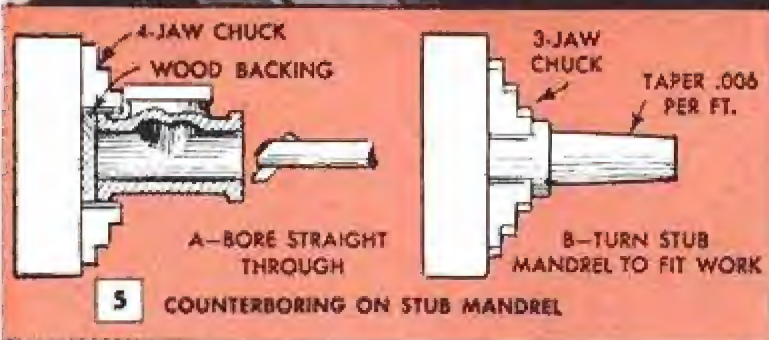
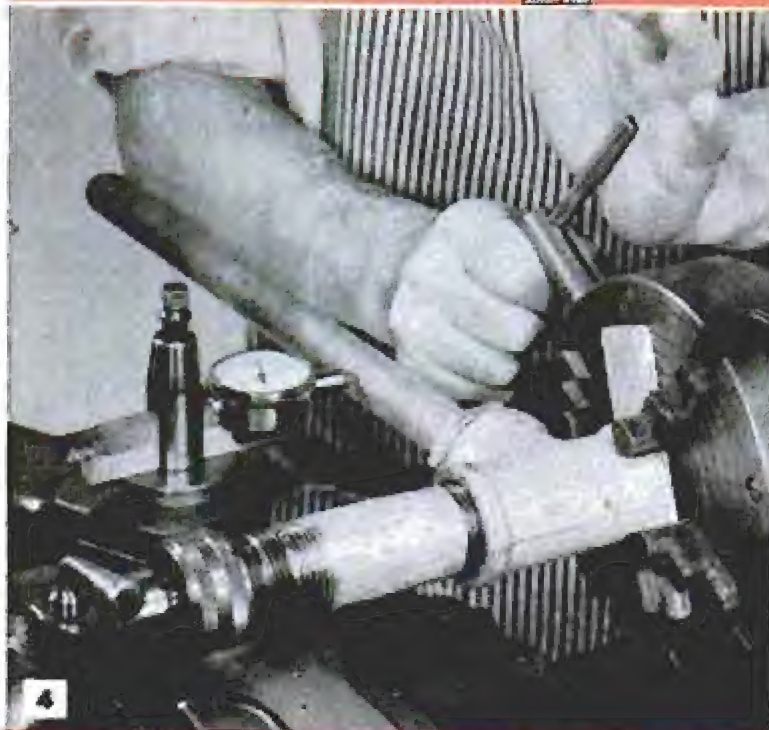
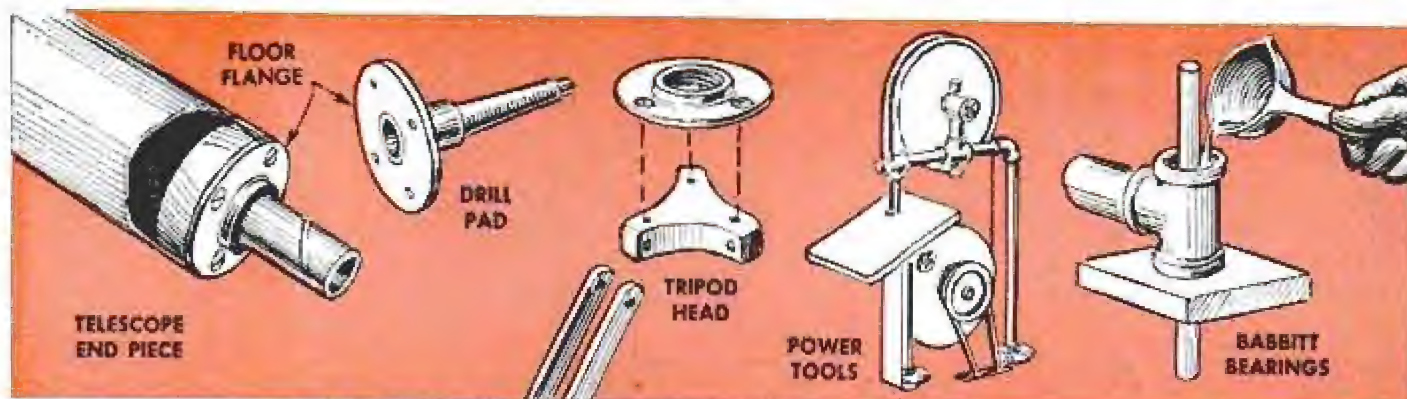
UNFINISHED PIPE and fittings can be assembled into a lathe bed, head and tailstock, a welding stand, table legs, drill-press head or a bandsaw frame. But when assembling a bearing housing, telescope mount or any similar unit requiring more precise fitting you will need to do light machining and possibly some filing. On these assemblies, black steel pipe is ordinarily used, rather than galvanized pipe. The former is cheaper and the surfaces are smoother both inside and out. On some types of work, cast-iron flanged fittings are an advantage. Steel pipe and fittings machine fairly well but tools must be kept very sharp, and light cuts and slow feeds must always be used due to the tendency of the metal to tear and score when heavier cuts are run.

The purpose of facing, turning and boring operations on pipe and fittings is, of course, to provide a finished surface against which, or over which, some other part fits. Nearly all types and sizes of fittings can be mounted in a lathe for facing operations simply by screwing the fitting onto a short nipple held in the chuck as in Fig. 1 and the upper detail in Fig. 2. Cutting is done on the headstock end of the work as in the detail. Although in this method of facing it is necessary to cut into the nipple in order to reach to the full



In assembling a unit by using pipe and fittings as frame, bearing mountings and other parts, it generally is necessary to machine some fittings to suit





thickness of the fitting at this point, the method does give a true face at right angles to the axis of the fitting. Other methods of chucking the fitting without use of a nipple are shown in details A and B, Fig. 2. In detail B the fitting is chucked and center drilled so that it can be mounted as in detail C. In this method of mounting, the fitting can be faced and the nipple machined along the length without removing the work from the lathe.

By boring the threads out of a fitting you can bring it to a telescoping, or sliding, fit over pipe of the same size. A pipe tee bored out to a sliding fit over a length of pipe has a number of practical applications. If the work requires that the axis of the bore be square with that of the side outlet, or leg, of the tee, make the lathe setup as in Fig. 4 and detail A in Fig. 5. A length of pipe is screwed into the outlet of the tee as pictured and a dial gauge is traversed along its length in order to position the tee accurately in the chuck before boring out the threads as in Fig. 6. Generally it is best to use a four-jaw chuck as it gives better support to the tee and also provides a means of perfect concentric chucking. Use a heavy boring bar to offset any tendency to error due to springing of the bar. After the setup has been made, bore straight through from end to end.

If a tee is to be counterbored, turning must be done from both ends. If the flanges are machined, then it is possible to chuck the tee as in detail A, Fig. 2, using a hardwood block as backing. Only very light cuts can be taken with this setup due to the overhang. As a rule, the best procedure when precise work is necessary is to turn a stub mandrel from hardwood, mild steel or a soft metal



Machining lengths of pipe between centers in a lathe can be done in several ways, but perhaps the simplest is to support the headstock and of work on a hardwood mandrel as pictured above. Usually it is necessary to use a brad as a driving dog. Note detail

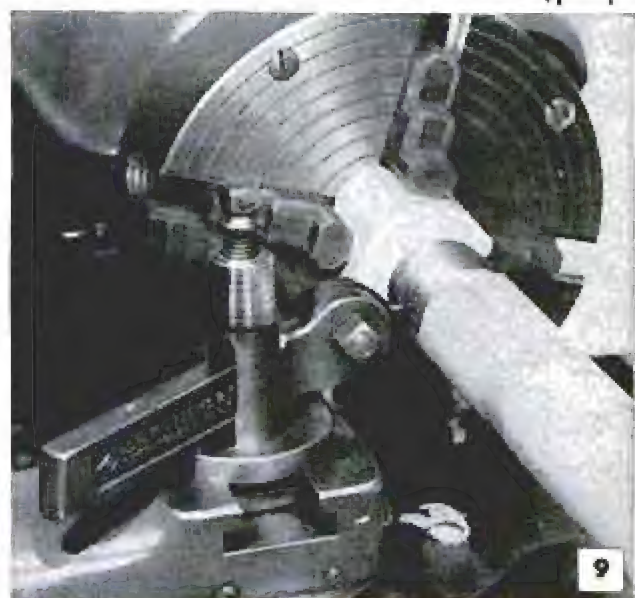


such as aluminum, Fig. 5, detail B. Mild steel is, of course, the best material, but hardwood or a soft metal will do for a "one job" mandrel. Use a gear puller to remove the tee from the mandrel for the second cut. Lousening the work by tapping with a hammer may destroy the accuracy of the setup.

In most types of assembly, using pipe and fittings, there is no need to machine the pipe along its length. But if a length of pipe takes a slide made from a tee or other part, then machining will be necessary to produce a smooth, sliding fit. Lacking regular pipe centers for the lathe, the next best way to mount pipe between centers is to use a hardwood stub mandrel, a pipe coupling and a ball-bearing tail center. Turn the mandrel as in Fig. 8 and mount the work as in Fig. 7. The drive fit of the wooden mandrel in the end of the pipe will permit light cuts only. When heavier cuts must be made, drill a small hole near the headstock end of the pipe and drive in a brad, or a finishing nail cut to length, to serve as a driving dog. Note the sectional detail below Fig. 8.

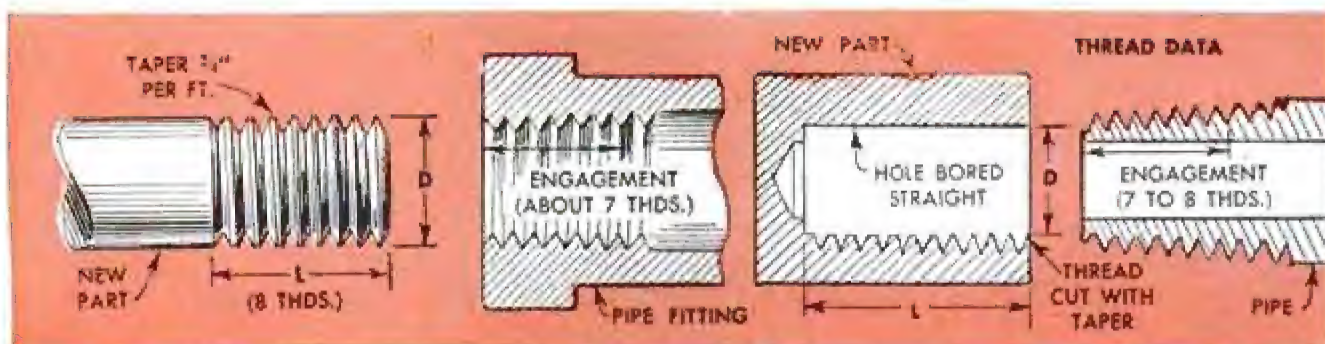
Not all sizes of standard pipe will telescope without machining one or the other or both of the joining members. Note in Fig. 3 that two of the common pipe sizes given will telescope loosely. The next two sizes down, $\frac{3}{4}$ and 1-in. pipe, will require only a very light cut on the $\frac{3}{4}$ -in. size. All the other sizes shown in Fig. 3, ranging from $\frac{1}{2}$ to $1\frac{1}{2}$ in. inclusive, will require a light bore in one member and a surface cut on the other to make a smooth, sliding fit.

Except in short lengths up to 6 in. or so it is not practical to bore pipe throughout the entire length. Shallow bores at one or both ends, where required, are of course, easily carried out. Long pipe can be cleaned inside when desirable simply by wrapping a piece of abrasive cloth around a dowel of the proper size and running this



back and forth through the pipe. This also can be done by chucking one end of the pipe in the lathe, removing the lathe tailstock and supporting the outer end of the pipe in a center rest. Then run the dowel carrying the abrasive back and forth through the pipe. This procedure produces a somewhat more accurate job due to the slow rotation of the work. A few drops of light oil on the abrasive will make it cut more freely and prevent it from "freezing" in the pipe.

In certain types of assembly it may become necessary to thread other materials or parts to join pipe. Pipe threads are cut with a taper of $\frac{3}{4}$ in. per ft., so you set the lathe taper attachment to $\frac{3}{4}$ in. per ft., Fig. 12, and you're all set to cut the thread. Of course, in this work the lathe compound must be used in the square position, as you use it also for the in-and-out cross-feed. You also can use the tailstock setover method for external threads with fair accuracy, the setover being made equal to $\frac{1}{32}$ in. for each inch of work length. The necessary data for this type of thread cutting is given in the tables, Figs. 10 and 11. The



10 NEW PART TO FIT INTO PIPE FITTING				
PIPE SIZE	D	L	BAR STOCK TO CUT 80% THREAD	HOW THE THREAD CUTS
1/8"	.376"	5/16"	3/8" STRAIGHT	51% 80%
1/4"	.497"	3/8"	1/2" STRAIGHT	55% 84%
3/8"	.631"	1/2"	3/4" STRAIGHT	45% 74%
1/2"	.783"	3/4"	1 1/8" .783 TAPER	74% 80%
3/4"	.992"	1"	1 1/4" STRAIGHT	56% 86%
1"	1.243"	1 1/8"	1 3/4" STRAIGHT	55% 85%
1 1/4"	1.587"	1 5/8"	1 7/8" 1.587 SLIGHT SHOULDER	80% 80%
1 1/2"	1.826"	1 3/4"	2" 1.826 SLIGHT SHOULDER	80% 80%
2"	2.299"	2 1/4"	2 3/8" 2.299	60% 80%

ALL THREADS TO BE CUT WITH TAPER ATTACHMENT SET AT 1/4" PER FT. ALTERNATELY, SET-OVER METHOD MAY BE USED WITH SET-OVER EQUAL TO 1/32" FOR EACH INCH OF WORK LENGTH

CLEARANCE GROOVE

ANY WORK DIA. OVER THE MINIMUM SIZE GIVEN IN TABLE CAN BE USED BY TAPER TURNING TO "D" DIMENSION AT SMALL END OF WORK

11 NEW PART TO FIT PIPE			
PIPE SIZE	THDS. PER IN.	D	L
1/8"	27	1/32"	3/16"
1/4"	18	3/16"	3/8"
3/8"	18	11/32"	1/2"
1/2"	14	3/8"	13/16"
3/4"	14	.941"	1 1/8"
1"	11 1/4	1.181"	1"
1 1/4"	11 1/2	1.525"	1"
1 1/2"	11 1/2	1.764"	1"
2"	11 1/2	2.238"	1"

* USE DRILL AND TAP

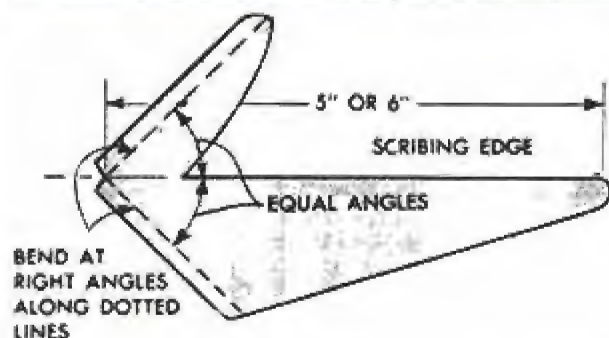


details in Fig. 10 under the heading "How the Thread Cuts" have been somewhat exaggerated for purposes of clarity. The dimension D in Fig. 10 is the diameter of work required to cut an 80-percent thread at the outer end of the work. When fitting new parts to pipe you will as a rule use standard stock sizes and the details are intended to show how these standard sizes will take the thread. On the other hand, if the thread is cut on straight stock, it will be only about 80 percent full at the outer end of the work and approximately 50 percent at the inner end. This depth of thread is adequate for nearly all practical applications and completely eliminates any tendency of the thread to bind at the crest. The thread in all cases is 8 threads long and the

engagement in standard pipe fittings will be about 7 threads.

When preparing to cut an internal thread in a part which is to take standard pipe the work is bored straight to dimension D, Fig. 10, and to the depth L as in the detail above Fig. 11. When the tapered thread is cut in the straight bore to the bore sizes given in Fig. 10, the thread at the outer end will be 100 percent and about 70 percent at the inner end. Such a thread will take up very tight when a standard threaded pipe is turned into it with an engagement of 7 to 8 threads. In some assembly jobs where pipe is used a straight internal thread is suitable, although the thread engagement at the inner end of the joining part will be rather loose. ★ ★ ★

Simple Gauge Locates Centers of Disks and Round Stock



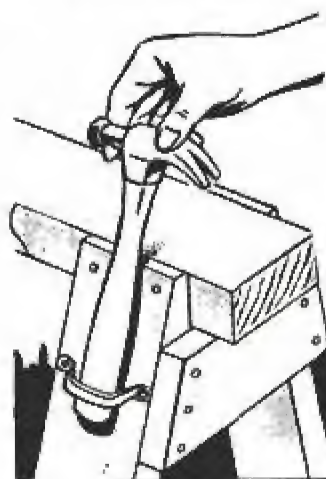
The center of a disk or any piece of round stock can be located accurately by using the gauge shown. It is made from a piece of fairly heavy sheet metal. The marking edge must be cut on a scribed line

that bisects the angle formed by the ends. The ends then are bent over at right angles to form stops. These stops are held snugly against the circumference of the work while scribing it. Two lines are scribed to cross each other, the point of intersection being the center of the circle.

Enno R. Haan, Evanston, Ill.

Hammer Pocket on Sawhorse

A screen-door pull, or handle, screwed to one leg of a sawhorse keeps your hammer handy when you're working on a remodeling

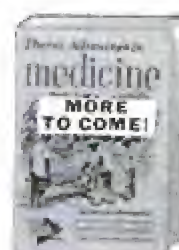
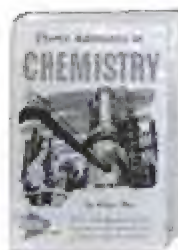


job indoors or out. If one forms the habit of dropping the hammer into the holder when measuring stock or sawing, it's not likely to be misplaced or lost. Although a screen-door pull is pictured, a strip of sheet metal or leather will serve the purpose equally well.

Molding Scientists Today — for America Tomorrow



Popular Mechanics is proud to announce to parents with an active interest in their son's future, a revolutionary new science career series



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Presenting a unique series of career books for the boy of today who needs and wants to know more about the scientific world we live in . . . and his place in the technical world of the future. Each story is told as exciting fiction and high adventure through the eyes of two teen-age boys, Randy and Sam Morrow. But skillfully woven throughout the fascinating stories are the even bigger, even more startling facts about the career opportunities in the sciences. The books suggest the kind of educational preparation needed in each, types of occupations that are now open and will be opening in forthcoming years. Moreover, in the telling the boy in your life learns a host of scientific and technical facts of lasting value. He also discovers in each story simple experiments he can do himself with common materials, and aptitude charts against which to pit his ability and talents.

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"There's Adventure in CHEMISTRY" has a preface by Dr. Harid C. Urey, Nobel Prize-winner in this field; "ELECTRONICS" is prefaced by Dr. Lee de Forest, father of the vacuum tube. These names will further thrill and encourage boys in their great new adventure into the sciences. Well researched and completely authentic, full of fun and facts, the "Adventure" books are a source of practical information and inspiration that can help shape your boy's entire life. Years from now, your scientist son or nephew may remember them as the decisive influence that started him on a vitally important, high-paying career. Order the CHEMISTRY, ELECTRONICS and ATOMIC ENERGY books for the boy in your life now. They'll be sent postage prepaid. Your money back **\$2.50** if not pleased. **Each only**.....

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SHOPPING FOR TOOLS

1. NAIL-STARTING HAMMER holds the nail in precise alignment with the head of the hammer for the starting blow. Hammer bell is grooved to take the shank of the nail, the head of which bears against a striking surface. A permanent magnet mounted in a non-conducting shield of nylon holds nail securely in place. Hammer is supplied with standard 16-oz. head

Royal Line Products, Inc., Mountaintop, Pa.

2. ADJUSTABLE-TIP WRENCH reaches into deep recesses, starts, tightens, loosens or places nuts, screws, bolts. Pressure on plunger with thumb as indicated in the center view, opens the jaws to take the head of a wood screw, capscrew or nut for placement and tightening. Releasing the plunger causes the jaws to grip securely for tightening or loosening

Tipco Mfg. Co., 14760 Calvert St., Van Nuys, Calif.

3. PORTABLE JIGSAW, or saber saw, is designed for cutting 2½ in. stock. Universal 2.7-amp. motor operates on 110-120-v., 25-60-cycle a.c., d.c., drives specially designed saber blade at 2700 strokes per min. Top handles for one or two-handed operation give better control when cutting stock up to 2-in. thickness and also when making ripping and pocket cuts

Sears, Roebuck & Co., 925 S. Homan Ave., Chicago 7

4. CHAIN-SAW ATTACHMENT fits 6 and 7 in. portable electric saws of same make. Cuts logs up to 18 in. in diameter in one pass. When screw-fastened in position chain-saw unit becomes an integral part of portable saw and is exceptionally light and well balanced. Chain drive is direct off saw spindle at regular spindle speed. Special guard protects hands

The Black & Decker Mfg. Co., Towson 4, Md.

5. BEVELING TOOL handles like a block plane, puts that finishing touch on the edges of hardboard panels, both plain and perforated. Simply by loosening a screw and canting the blade in hardwood frame, bevels 45 deg. or less can be cut on the edges of the panel. Depth of cut also can be controlled to a nicety. The sharp blade makes a smooth, clean cut

Kimball Mfg. Co., 816 University Pl., Evanston, Ill.

6. DUAL-PURPOSE HAND TOOL becomes a plane or a file simply by loosening a screw and shifting one handle to either of the two positions pictured. As a plane it makes a smooth cut on any kind of wood. With the handle shifted to the lower position it serves as a fast-cutting rasp on hard or soft woods, and also as a file for any metals that can be filed

Millers Falls Co., Greenfield, Mass.

7. OPEN-END WRENCH of new design applies turning forces only on flat faces of nut, never on the corners, makes it possible to tighten or loosen even badly worn nuts and capscrews without rounding the corners. Spans four flats on a hex nut or capscrew, applying pressure at all four points. Made from special alloy steels to withstand high torque

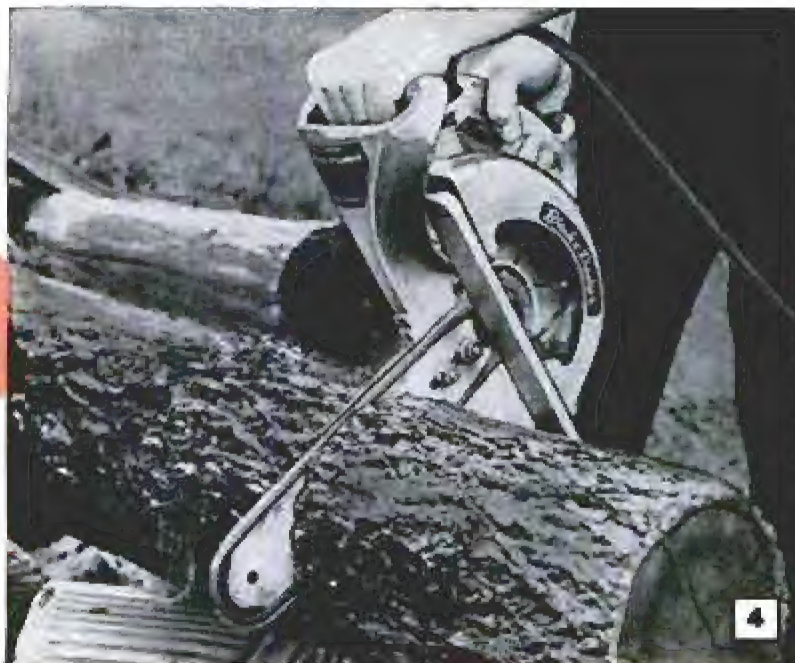
The New Britain Machine Co., New Britain, Conn.

8. FILING VISE for circular saw blades is designed to permit tilting blade to 45 deg. Locks rigidly at any angle. Takes blades from 4 to 18 in. in diameter, having arbor holes from ½ to 1¼ in. Arbor hole fits over a threaded stud assembly which is a part of the vise. Blade is held in position by a cone that engages stud when a plunger is released

Foley Mfg. Co., 3660 N.E. Fifth St., Minneapolis 18, Minn.



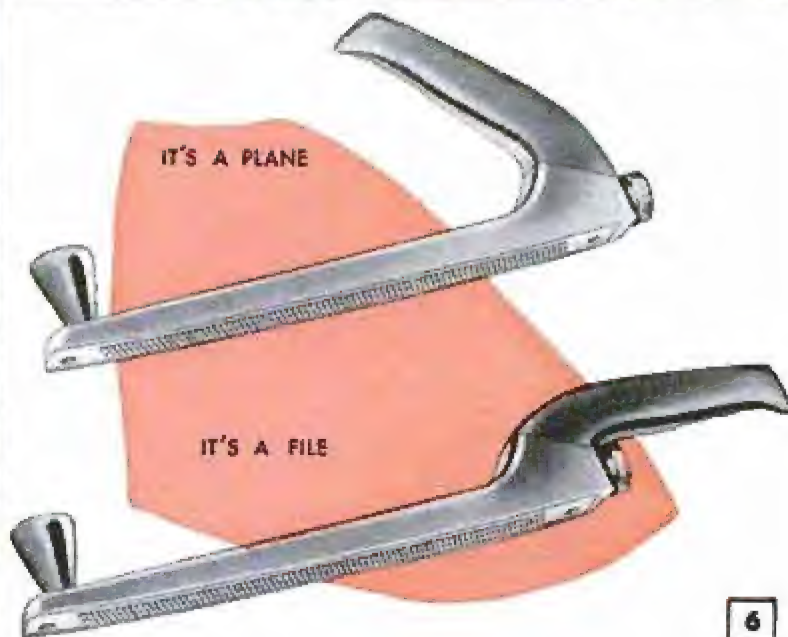
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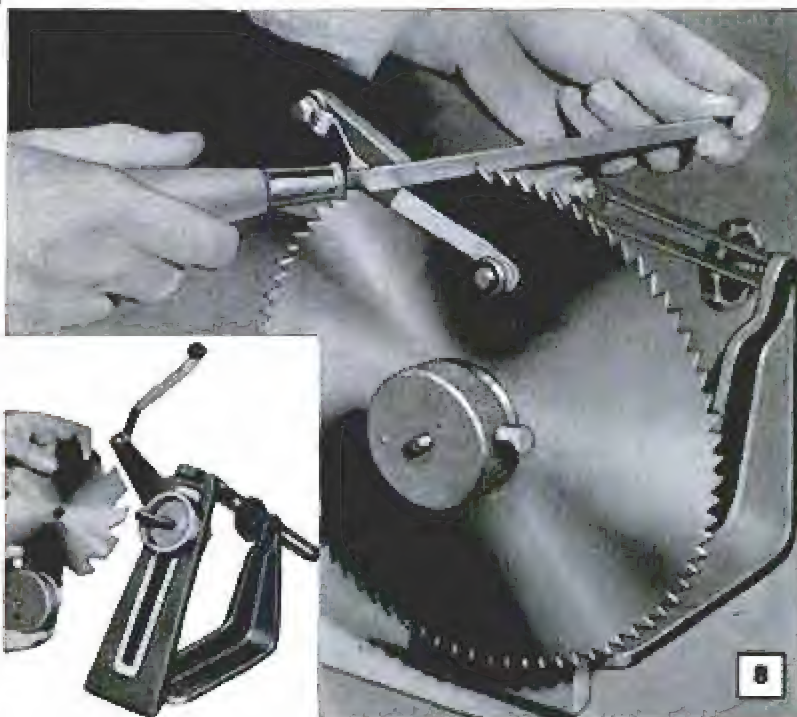
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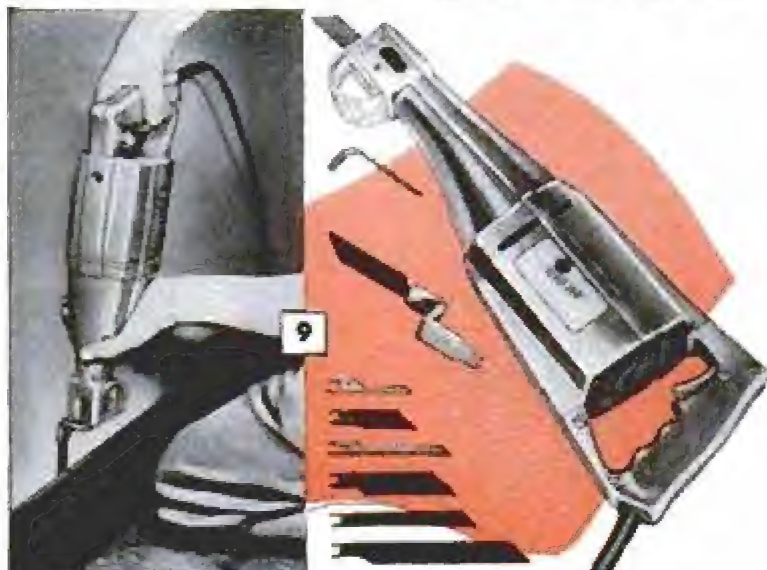
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8

SHOPPING FOR TOOLS

Continued from preceding page



9. SABER SAW cuts flush with any surface, either horizontal or vertical. Cuts nails, bolts, pipe, conduit, any metal that can be hacksawed. Blades are available for different types of work. A 5-amp. motor drives blades at 2500 strokes per min., provides power plus for all heavy-duty jobs. Fitted with a saw-grip handle for better control in heavy cutting

R.C.S. Tool Corp., P.O. Box 661, Bloomington, Ill.



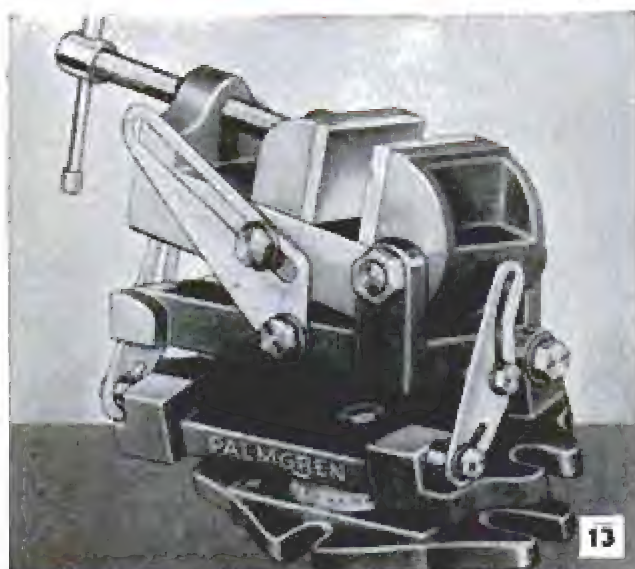
10. BALL BEARING for linear motion is split longitudinally and designed to provide preload fits when mounted in an adjustable-diameter housing. Available in standard sizes for shaft diameters ranging from 1 to 4 in. Adjustment feature provides for building free-running, no-play linear shaft motion into many types of machine tools and special equipment

Thomson Industries, Inc., Manhasset, N. Y.



11. CHISEL FOR TUCK POINTERS removes mortar in old brickwork to a uniform depth in preparation for pointing the joints with new mortar. Also handy for removing mortar for insertion of metal flashing. Available in any one of three cutting depths, $\frac{1}{2}$, $\frac{3}{4}$ and 1 in. Depth is controlled by two fingers, or slides, which bear on bricks above and below joint

Harry G. Barr Co., 1213 N. 32nd St., Fort Smith, Ark.



12. SLIP-ON PADS convert any conventional hammer to use as a soft-face hammer on machined metals or in any type of work where it is necessary to strike effective blows without denting or otherwise marking surface of work. Face of the soft slip-on is just the right hardness to transmit the force of a blow without rebounding from surface of the work

W. J. Ruscoe Co., 483 Kenmare Blvd., Akron 1, Ohio

13. UNIVERSAL ANGLE VISE for milling, grinding, drilling, and various checking operations on partially finished parts, is furnished with a swiveling base which permits it to be mounted in almost any position desired, either on a machine table or on the bench. Vertical and horizontal scales graduated from 0 to 90 deg. provide for setting up work quickly

Chicago Tool & Engineering Co., 8323 S. Chicago Ave., Chicago 17

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so can you!*



Pfc. Frank J. J. Kirchner, Jr.
Annapolis, Maryland
Graduate,
Annapolis High School

"I found only the Army would give me just the schooling I was looking for. Under its technical training program for high school graduates, there are so many different varieties of courses, there's one for everybody. I chose Supply Management, and the course was even better than I thought. You can pick your training, too."

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"I don't know where you could find a better Construction Surveying course than the one I took under the Army's technical training program. What's more, only the Army guarantees you the course you want *before* you enlist. That was really important to me because I knew just where I was going when I enlisted. I'd sure advise you to find out about this great training opportunity."

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You turn it on, and it does the rest



Fully automatic timer shows slides at pre-set intervals—4, 8, or 16 seconds. Split-second changes at any speed.



Remote-control changing up to 12 feet from projector—control show as you sit with guests. Cord included.



Semi-automatic changing—turn wheel to show slides in backward or forward order. Reverse order at any time.

EASTMAN KODAK COMPANY,

POPULAR MECHANICS

New Kodak Cavalcade Projector changes slides by itself!

You turn it on . . . it does the rest!

IMAGINE! A color slide projector that lets you relax and enjoy the show without touching a button . . . that will project your slides perfectly even if you leave the room.

The new Kodak Cavalcade Projector combines *all* the features you have ever wanted for the *easiest, smoothest* slide shows ever!

For automatic operation, you simply set the timer for the interval you want. Turn on, focus the first slide, and your Cavalcade Projector does the rest.

There are 3 ways to enjoy semi-automatic changing, too. For remote control, a remote cord is included. By push-button, at rear of the projector. Or you can use the control wheel at the side.

Your slides stay in constant focus, because all slides are preconditioned with a stream of air before projection. Never any focus-shift no matter how many slides you show!

The Cavalcade is the only projector that lets you "edit" your slides *while they're in the projector!* You can remove one slide, replace it with another without removing the slide

tray. There's a built-in screen pointer, too.

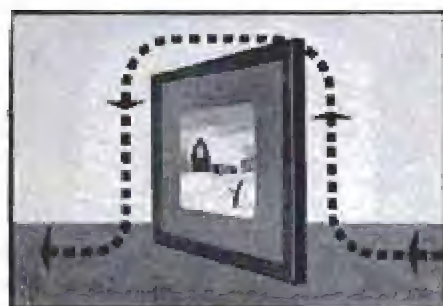
When you place the slide tray into the projector, you insert it *right side up*. Your slides can't spill out.

Choice of slide trays: (1) Takes 40 cardboard slides. (2) Takes 30 glass, metal, plastic slides. U-shaped steel guards protect all slides.

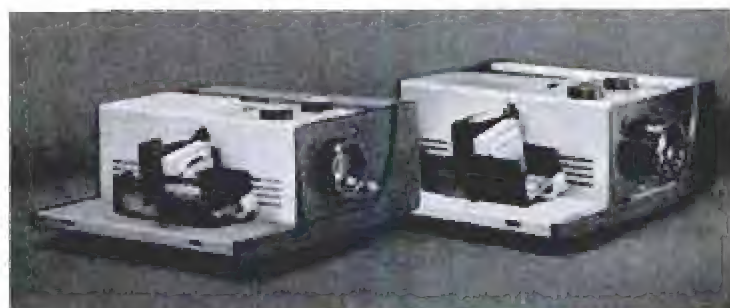
A hi-lo switch on the Cavalcade Projector lets you project with *either* 300 or 500 watts, according to your needs. For "super slides" a supplementary condenser is available for extra-bright showings.

The Cavalcade Projector has an $f/2.8$ lens and a built-in preview screen. Ask your photo dealer to demonstrate the compact new Cavalcade Projector. It has been precision-designed by Kodak to deliver years of wonderful color slide enjoyment.

Price, including 12-foot remote control cord, \$149.50, or \$14.95 down. Price is list, includes Federal Tax, and is subject to change without notice.



Constant focus — No "pop."
A special stream of air pre-conditions every slide—prevents focus-shift during show.



New Kodak 500 Projector is as easy to carry as a portable radio, shows color slides big and bright. Kodak 500 Projector, \$74.50. Also —Kodak 300 Projector, \$64.50.



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This "mighty midget" is a natural for a tight grip on small work in hard-to-get-at places. Only 4-1/2" long... drop forged from high grade steel. Four exclusive Channellock precision grooved jaw adjustments... capacity to 1/2". Skilled mechanics say it's one of the handiest pliers in their kits. You'll say so, too!

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Clinic for Homemakers



As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of *Popular Mechanics* invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Ill.



Paint Mildew

Q—What can be done to prevent mildew on exterior paint? The first summer after my new home was painted, a spotty discoloration appeared here and there on the painted siding. Now it is spreading, particularly on the north side of the house but there are a few areas affected on all sides.—N.O., S. C.

A—We hesitate to recommend the procedure because of the labor and time involved, but probably the most effective way is to scrub the siding with a strong solution of washing soda, giving the areas already coated special attention. After scrubbing, which should be done with a fairly stiff-bristled brush, hose the surface with a fine spray of clear water. Allow to dry a week or more, then go over the surface of the siding with medium steel wool. Brush the surface lightly as you go along to remove any loose material. Then repaint, using an exterior paint containing a mildew preventive. If the original paint is still in reasonably good condition, then one coat of new paint probably will do the job. If you use two coats both should contain the preventive.

Lacquer Lifts Finish

Q—Recently I attempted to re-finish an old chest of drawers with colored lacquer. The lacquer set so quickly I couldn't apply it with a brush, but had to use a spray gun. The lacquer wrinkled and peeled only a few minutes after application. What is wrong? C.M.—Kansas City, Mo.



A—There are several possible causes of the result you describe but we think it is likely that you used an industrial-type lacquer containing a fast-acting solvent. This would be practically certain to raise any nonlacquer finish over which it is applied, causing it to wrinkle and peel. You should have used a nonraising brushing lacquer for this job. This lacquer contains a slower solvent and can be applied over most oil-base finishing materials, provided there is no trace of wax grease, mineral oil or furniture polish on the surface. Of course, you will have to remove all the damaged finish.

New Coating Over Old Concrete Floor

Q—My concrete basement floor is quite old and is dusty, rather uneven and there are two cracks near one of the posts supporting the center beam. Damp spots show at these cracks during wet weather but

(Continued to page 210)

Test Turbo-Thrust Chevrolet scats up a punishing grade, two miles high in the Chilean Andes.



Even the Andes aren't high enough to make this V8 breathe hard! CHEVY TURBO-THRUST!

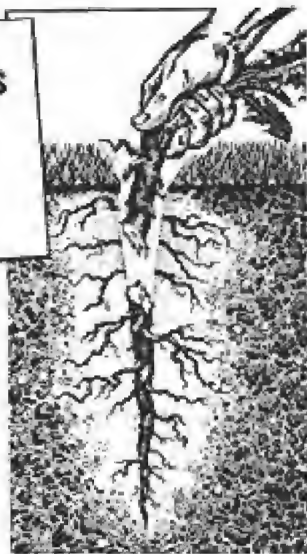
Tackle the toughest roller coaster of a road you can find—one that scrambles to a dizzy 12,572 feet—and even then you won't take the real measure of Chevy's new Turbo-Thrust V8!* We proved that on the fantastic General San Martin Highway over the South American Andes, on gravel grades that ran up to 30 percent out of hairpin turns, in air so thin drivers gasped for oxygen. The tremendous torque of Turbo-Thrust's 348 cubic inches made every foot of the climb seem incredibly easy; its radical combustion-chamber-in-block metered out flawless performance from sea level to 2 miles in the sky! The Turbo-Thrust ran ocean to ocean and back in 41 hours 14 minutes—and the ignition key was never turned off, the hood was sealed shut! It's the greatest engine going in the low-price field today—and you can prove that right in your hometown traffic! Sample it and see for yourself! . . .

Chevrolet Division of General Motors, Detroit 2, Michigan. *Optional at extra cost.



Here's what happens
when you
PULL weeds

You don't get the whole weed—because you don't get *all* the roots! You may hope you do, but tiny roots always remain to grow again. So you've got the job to do over—and sooner than you think. Yanking weeds is just not effective . . . not thorough . . . not lasting.



Tiny roots remain—to grow again

Here's the result when you KILL weeds with **WEEDONE**

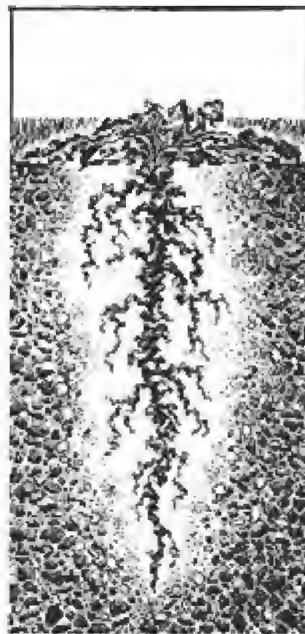
THE MIRACLE WEED KILLER

You kill not just the surface plant and main roots. You kill every hidden root. For Weedone's action is deep—its killing power penetrates to every tiny root; so there's nothing left to regrow. Weeds *stay* killed with Weedone. You do a thorough, lasting job. Yet remember—

**WEEDONE DOESN'T
KILL LAWN GRASSES**



Weedone Easy Weed-Away
Applicator 59c



All roots killed —
nothing to regrow

New dry form for use in a
spreader. 5-lb. bag \$2.25 (slightly
higher west of Rockies)

ALSO LARGER SIZES

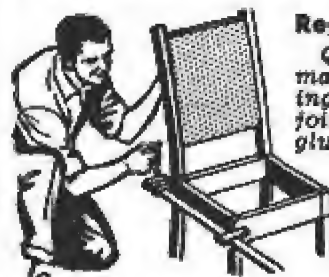
AMERICAN CHEMICAL PAINT COMPANY

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Originators of 2,4-D and 2,4,5-T Weed Killers

(Continued from page 208)

no appreciable amount of water appears to come through. I'd thought of pouring an average of about 1½ in. of new concrete to even it up. But I'm told that this coating is too thin and that it won't stick to the old concrete. Is there anything else I can do?—C.O., Va.

A—It is not advisable to attempt coating old concrete with new concrete averaging 1½ in. in thickness. At some points you undoubtedly would have to feather the new coating very thin over the old. This would break up. Rather we would suggest that you consider applying any one of several products available which are specially compounded for application to old concrete floors. These are said to be quite durable and can be feathered very thin where necessary to level the floor. The floor must be clean, thoroughly dusted and any grease or paint spots removed. In the application of the new product (obtainable from your local building-materials dealer) be sure to follow instructions in all details.



Regluing Old Chairs

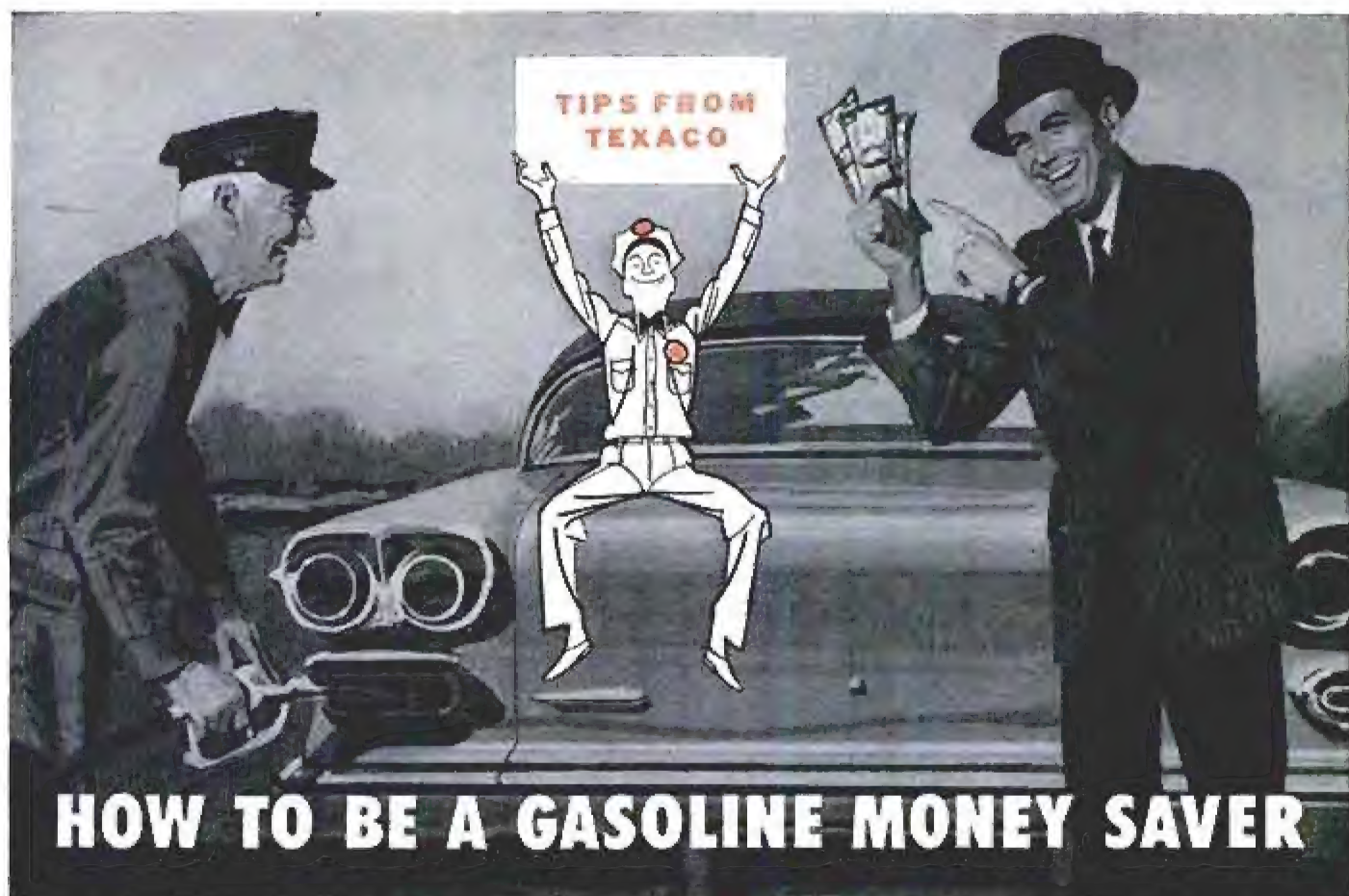
Q—Some time ago I dismantled several old dining chairs and reglued the joints. For some reason the glue did not hold. Now all the joints in each chair are loose again. Joints are of the mortise-and-tenon type. What's wrong with this job? G.G.—East St. Louis, Ill.

A—You did not say what kind and type of glue you used and this leaves us rather uncertain of the cause. If you used a dry-powder glue, our guess would be that the powder was exposed to dampness sometime during storage. Either that or the glue—any of the dry-powder glues—was not properly mixed. Proportions of the mixture are quite critical and unless one follows the directions explicitly, the resulting mixture is apt to be either too thick or too thin. If the mixture is too thick, it will not bond the parts together at full strength. If too thin, most of the glue will be absorbed by the wood, resulting in a weak joint. There also is the possibility that not enough glue was used to assure an even coating on all the meeting surfaces of each joint. We suggest that you do the job over, using fresh glue carefully mixed in the proportions given by the manufacturer. Make sure there is sufficient glue in the joints so that a small quantity oozes out of the joints when the clamps are drawn up.

Plaster on Masonry Wall

Q—For some time I have planned the construction of a home with brick walls, cinder-block backing and plaster directly on the blocks. It appears to be the cheapest masonry wall I can have built. My contractor says he will build such a wall but he refuses to take responsibility for the moisture condensation which he says is certain to cause trouble. He wants to attach furring strips to the blocks, apply insulation and what he calls a vapor barrier, and then plaster over this. This is more expensive. Is he right?—A.L., Ky.

A—He is right. In fact, he is recommending what is generally considered sound construction of an all-masonry wall for homes. Perhaps some builders would prefer to use concrete backing blocks rather than cinder blocks or possibly one of the light blocks (made from light aggregates) for the backing, but use of any one of the three types as backing usually is considered good practice. When you build with solid masonry you are inviting condensation on the room side of the outside walls, especially those with the northern exposure. This can become excessive and damaging during the colder months due to the relatively high humidity of the air in the rooms. The surface of the all-masonry wall is several degrees colder on the room side than the air with which it is in contact. This causes the moisture in the air to condense on the colder surface of the wall. Note the beads of moisture that gather quickly on the outer surface of a glass tumbler full of cold water on a warm summer day and you are looking at essentially the same thing. We'd recommend that you follow your contractor's suggestion, even though the initial cost is higher.



"SAVE MONEY as you drive," says George, the gasoline saver . . . claims he puts a lot of extra spending money in his pocket with what *he* saves on gasoline . . . in ways like these:

He keeps his engine tuned . . . plugs clean for full firing . . . distributor points and breaker gap clean and correctly set . . . air cleaner unchoked by dirt, a free-working, properly adjusted automatic choke valve to avoid an over-rich mixture.

He saves as he drives. Avoids gasoline-wast-

ing jack rabbit starts and unnecessary spurts and slow-downs . . . coasts up to red lights with minimum braking . . . shuts off his engine instead of costly idling.

Other gasoline saving factors—fully inflated tires and aligned wheels push easier . . . the right engine oil (see below) saves starting and running drag . . . a car needs more than three times the power to do 70 instead of 35 and gives less than half the economy. "Also," says he, "I get top mileage with Texaco Sky Chief Supreme gasoline."



Four to forget—just one to remember

Now you can forget about motor oil grades. New all-temperature Havoline Special 10W-30 combines the advantages of 4 grades in one. Your car always gets full-bodied, free-flowing lubrication under *every driving condition*—cold starts—intense heat—any climate—any season. Now . . . Havoline "thinks for itself" to save your thinking about seasonal grades. Also cleans as you drive to wear-proof your engine. Get it from your Texaco Dealer, *the best friend your car has ever had.*

THE TEXAS COMPANY

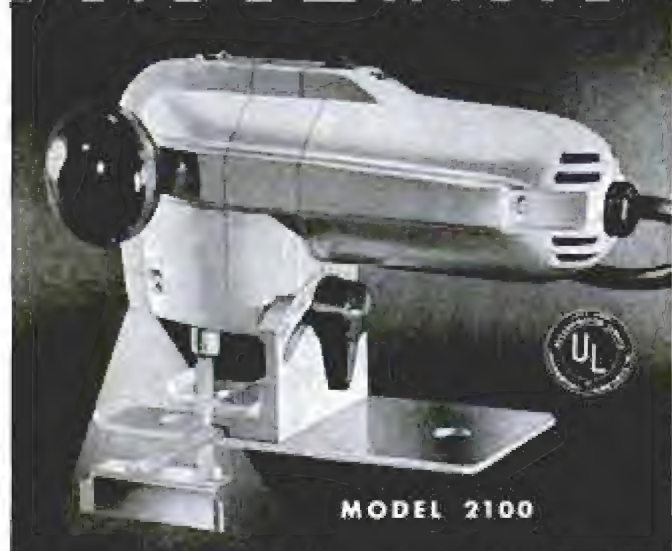
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ALL-NEW JIG SAW

There has never been a jig saw like this! It has *everything* . . . every conceivable feature to make sawing easier and more professional, plus the lowest possible price! With its three special blades, you can do the work of seven other saws: rip, band, coping, crosscut, scroll, key-hole, and hack saw!

NO OTHER JIG SAW HAS SO MANY FEATURES—YET IS PRICED SO LOW!

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- Perfect Balance and Compact Design!
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**CUTS 2x4's,
PERFECT CIRCLES,
BEVELS TO 45°!**



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COMPLETE

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PORTABLE ELECTRIC TOOLS, INC.

Dept. PM58 • 320 West 83rd Street • Chicago 20, Illinois

He Builds Monsters

(Continued from page 143)

a fact demonstrated not long ago when Nelson climbed aboard his monster for a photographer's benefit.

Replica Stronger Than Original

The replica is, in fact, far more sturdy than its prototype. With hollow, cardboard-thin bones and wings of the thinnest membrane, Pteranodon weighed only 25 pounds in spite of its size. Unable to propel itself efficiently by flapping its wings, it soared with the wind currents, swooping low over the water to grasp fish with its huge beak. Once on the ground, it probably had to crawl to a high point to take off again.

Although Pteranodon is generally considered to be one of nature's greatest freaks, others represented in Nelson's displays are almost as unique.

Extra Brain in Hips

Stegosaurus, for example, carried a row of bony plates, appearing like giant arrowheads, along his back. On the end of his tail stood four spearlike spires that probably were his best defense. Although his brain was tiny, he had an "auxiliary brain," an enlarged section of spinal cord, over his hips.

Triceratops was a low-slung, 10-ton monster with a head nearly one third the length of his 28-foot body. He looked very much like a cross between a rhinoceros and an army tank. Despite his formidable appearance—with three spiny horns on his face and a great bony shield protecting his neck and shoulders—he was a lethargic plant eater, perfectly content to stay out of trouble.

Trachodon, one of many duck-billed dinosaurs, lived near the edge of the water some 70 million years ago. He had a mouthful of peglike teeth—2000 of them—but science does not record whether he ever suffered from toothaches. He was a good swimmer and this probably was his only defense against the fearful meat-eating Tyrannosaurus which lived during the same period.

Even Baby Dinosaurs

Tyrannosaurus was one of the most vicious beasts the world has ever known. He lived to kill and surely was the ruling reptile of his time. Having killed and eaten his prey, he settled down for a week-long sleep—until he was hungry enough to kill again.

Triceratops eggs, with two newly hatched Triceratops, form another of Nelson's displays, illustrating that dinosaurs were egg-

(Continued to page 214)

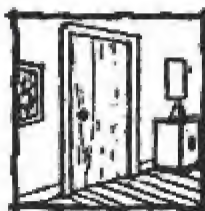
Throughout
the
home...

...enjoy the
beauty and
protection

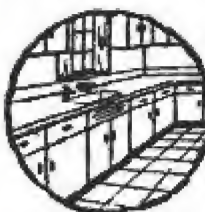
of
**NATURAL
WOOD FINISHES**



KNOTTY PINE



**FLUSH BIRCH
DOORS**



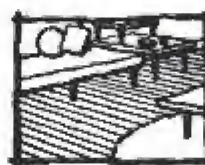
CABINETS



FURNITURE

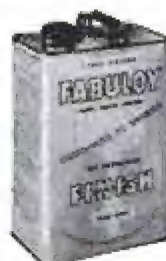
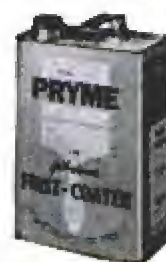


PANELLING



FLOORS

PRYME the fabulous First-Coater . . .
"Seals thirsty Wood." On *any* kind of wood,
a base coat of PRYME insures the *lightest*
possible natural finish . . . prevents "spotti-
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FABULON the clear wood finish with
amazing Resin "X". Preferred to varnish
and all other clears for ease of application,
beauty and durability. Use *Clear Gloss* for a
brilliant, mirror-like finish; use *Clear Satin*
for a soft, luxurious sheen.

FABULON the famous "bowling-
alley" finish for home floors. Applies easily
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other floor finish on any kind of wood floor.
Never needs waxing or scrubbing!



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THE NATURAL
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laying creatures. The reconstructed eggs are 28 inches long and 9 inches in diameter.

Nelson has additional displays in the nondinosaur category. Elasmosaurus, a strange combination of fish, snake and lizard, was 50 feet long and weighed 10 tons. He swam like a sea turtle, propelling himself by flippers. His long, snakelike neck probably made him an efficient fisherman.

Cynognathus, a small reptile that lived 180 million years ago—long before dinosaurs — had characteristics of both lizard and dog and may have been a forerunner of present-day warm-blooded mammals.

More and Bigger Monsters

But Nelson is not through yet. Still another monster is Brachiosaurus. As big as a house and more than three stories tall, he was the largest dinosaur known to have existed. This enormous creature weighed 50 tons. Brachiosaurus was so huge that it is doubtful that his legs, big as they were, could have supported his tremendous bulk in walking. Once he left his usual water habitat, he probably could do little but collapse on shore.

During the past two years, Nelson has received much favorable comment on his work. He values most the comments that come from dogs. Tyrannosaurus must be a bone-chilling sight to "man's best friend"

because dogs have found considerable reason to bark and growl at this monster. One terrified German police dog could not be dragged to within 30 feet of it.

"If you can build them good enough to fool a dog," Nelson chuckles, "I guess you're doing all right." ★ ★ ★

TV and Phone Signals Handled By One Radio-Relay System

Television programs and private telephone conversations can be transmitted together over long distances by a single radio-relay system being built in Canada. Telephone and TV signals are mixed at the transmitter and unmixed and sent their separate ways at the receiver. Spanning Canada from Halifax to Victoria, the system will solve the problem of providing network TV service as well as long-distance telephone communication to widespread cities requiring only a few circuits.

Machine Signals Need for Blood

By automatically and continuously measuring the amount of blood lost, an electronic machine has been devised that enables doctors to know when a patient needs a blood transfusion during surgery.

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And it's got
real **FORD** "go"!



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English Ford Line engines are extra thrifty on gasoline, give you lively Ford performance, with power to spare! Service anywhere because nuts and bolts are

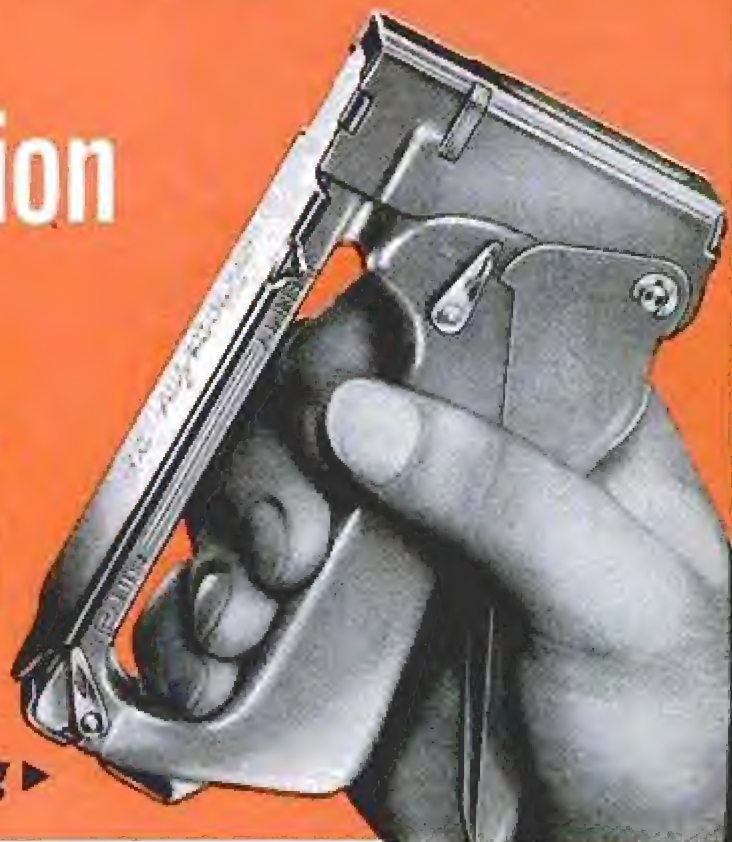
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NOW! a Hi-Compression Staple Gun for \$4.95

*With built-in staple extractor
and exclusive push-button loading ▶*



Never before has such an indispensable tool for the home been priced so low. If your tool chest includes a hammer and a screwdriver, then you should also have this basic tool...one that automatically drives two-legged staple-nails flush with a powerful thrust and *holds tight*. This precision tool delivers as much driving power as machines twice its size and weight. Handle locks to fit pocket...is easy to load with Swingline's patented *push-button* open channel that eliminates jamming. Extremely light weight, maneuverable, balanced for tireless use. Choice of Gray, Red or Green. Takes 2 staple sizes, 1/4" and 5/16".

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3. **SWINGLINE Household Stapler**...complete with wall bracket. fastens, tacks. 4 decorator colors. \$2.95
4. **SWINGLINE CUB Stapler**. For home, school and work. It staples, mends and tacks. Red, green and gray. \$1.29



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How to select a paintbrush

A good brush performs better... wears longer... saves you money



Check these points when buying your next paintbrush.

First, look for a full stock of bristles in a firm, strong setting (1). Avoid brushes with loose bristles. Then inspect the individual bristles closely (2). They should be finely tapered, with slightly curled



tips. Look again and be certain a generous portion (at least 10 to 20 per cent) of the bristles have tips which are split or "flagged" (3).



Your final assurance of a brush which will give the best painting performance is bristles of varying lengths (4).

but with a high proportion of longer lengths.

If the brush you look at passes all these tests, it will have a greater



working and paint-holding capacity and eliminate excessive dipping. It will (5) release any type finish smoothly and evenly on any surface.



One short cut to selecting a good brush is to look for the black and yellow tag, signifying a brush with TYNEX nylon bristles

(6). Properly made paintbrushes with tapered bristles of improved Du Pont TYNEX nylon give you better painting performance. They pick up a full paint load at every dip and give velvet-smooth paint-out. With proper care, brushes with durable bristles of TYNEX clean easily... rinse thoroughly... are quickly ready for another job.



FREE—"How to Choose and Use a Paintbrush." This booklet tells how to paint walls, ceilings, trim, furniture, radiators and do other special jobs. Gives tips on the correct painting stroke, how to hold a paintbrush, how master painters dip their brushes, how they clean them. Tells what kind of paintbrush to use for each painting job. Write to E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Dept., Room 535, Du Pont Building, Wilmington 98, Delaware.



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NYLON BRISTLES

BETTER THINGS FOR BETTER LIVING... THROUGH CHEMISTRY

Those Wonderful "Thinking" Machines

(Continued from page 137)

old-age—has just been co-authored by UNIVAC and Dr. Louis G. Henyey of the University of California. Dr. Henyey began with what science knows about the sun, the sun as we see it today, which by most estimates is just now celebrating its 4.5 billionth birthday. Then, feeding UNIVAC a complex of data, the brain was told to predict a solar life cycle. Result: With 60 hours of brainwork, the computer authored the biography which forecast the sun's self-destruction, through thermonuclear explosion, some 5.5 billion years hence.

With it all, some computer men lose their composure when their electronic creatures are referred to as "brains," "wizards" or "genius machines."

"They Can't Think"

"They can't think any more than a stone." fumes Harvard Prof. Howard Aiken, who should know. Back in 1936 it was Aiken, then a young Harvard physicist, who happened upon some 100-year-old writings of a Cambridge University mathematician named Charles Babbage.

Babbage had worked up a contraption he called a "differential engine," which wasn't an engine at all. Using 26 digits, it was supposed to simplify the computing of mathematical tables. Abandoning it, Dr. Babbage conceived another—the "analytical engine"—which took its orders from small cards punched with coded instructions. Nothing much came of Babbage's "engines" for, unluckily, he was born a good hundred years too soon—long before anybody had developed the intricate electronic components which are today the heart, brain and lungs of the modern computer.

First Calculator That Worked

Like Babbage, Dr. Aiken quickly perceived that a robot could do the thinking of hundreds of men in a fraction of the time it took any one of them to work out routine mathematical problems. Aiken teamed with IBM researchers. By 1944 they'd built the first workable electronic calculator.

It was grandfather of today's robots, room-size monsters who answer to such subhuman—and unlikely—names as Bizmac, Seac, Eniac, UNIVAC, Nore and Datamatic 1000.

Scarcely had the average American mastered these tongue twisters than UNIVAC was cast as the heavy in 1952's

(Continued to page 218)



Spring into Action!



They filter the oil with the greatest of ease—that's why more new cars are equipped with ACs!

So, when you get your car ready for an action-packed Spring . . . do what the majority of car owners do . . . install a new AC Oil Filter!

A new AC Oil Filter cleans all of the oil in the engine every 30 seconds at normal driving speeds . . . protects the precision parts from dirt, dust, grit and bits of metal as small as 1/100,000th of an inch. And you get all of this AC engine insurance for a full 5,000 miles for the extremely low cost of only 1/20th of a cent per mile!

The next time you change the oil in your engine—change to a new AC Oil Filter, too.



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CHANGE OIL AND FILTER, TOO!

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**KENDALL REFINING COMPANY
BRADFORD, PENNA.**

election-eve melodrama. Lights flashing, a melodious clatter coming from somewhere deep within its vitals, UNIVAC behaved like an obstreperous Quiz Kid. One look and millions of viewers were convinced that only a genius could tame—much less understand—one of the genius machines. That first public impression was as regrettable as it was erroneous. For there's nothing superhuman about the *thinking* machines, nothing that can't be explained in terms which even a sixth grader can understand.

When They Multiply, They Add

For all their lights, gadgetry, solenoids and transistors, the robots can do more than add, subtract, multiply and divide. And most of them do it the hard way. Ask a robot to multiply 999 by 6 and it'll *add* six 999s. Nor can robots think. Their memory mechanism merely stores a great quantity of data—data put there by their handlers who in robotdom are called *programmers*. Ideally, a programmer, far brainier than any robot, is fluently conversant in the only language common to all computers—mathematics. When a programmer "speaks" to his transistor-brained Quiz Kid it is through the medium of punched cards, magnetic or paper tapes and sometimes through the keyboard of a special typewriter.

The programmer coaches the robot every step of the way. He tells the machine when and how to make simple decisions (when, for example, to add or subtract). He instructs the monster what to do with numbers after it has digested, compared and tabulated them. And when a robot suffers a nervous breakdown, almost always it's the programmer's fault.

Robots Become Paymasters

Take that paycheck of yours. Before robots turned paymaster in many big companies, a clerk figured your deductions—your taxes, Social Security and savings bonds—on a calculating machine. She multiplied your overtime by your hourly pay scale and eventually came up with your take-home pay. When the payroll was finished it was routed to other clerks who made out the checks.

Well, before a robot can compute your pay and print your check, it needs the same information. What's more, it goes through the same mental processes as the clerk: It multiplies, adds, subtracts.

Robots, no matter how massive or complex, have sensing and thinking organs duplicating the human anatomy. They "see" and "hear" through their *input*

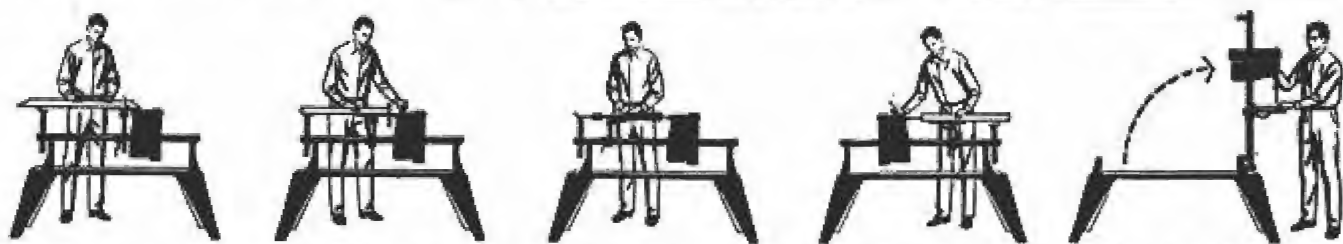
(Continued to page 220)

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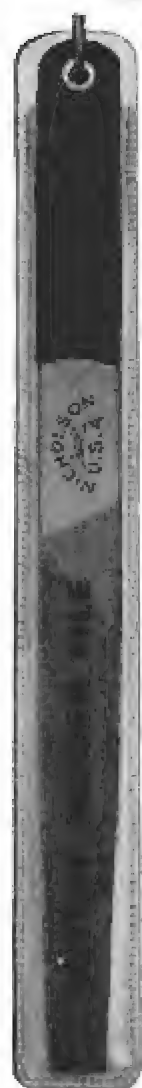
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systems—the electronic "eyes" which read the programmers' instructions punched into cards, carried by tapes or communicated by typewriter. The robot stores these instructions in one of its several memory devices.

Like humans, robots don't all think alike. Some have better memories than others. Some think faster or have a penchant for concentrating single-mindedly upon problems involving *physical* quantities—pressures, electrical currents, velocities. Robots that are physically minded are called *analog computers*. They comprise one of the two great families of thinking machines. The other branch of the family—*digital computers*—think mostly in digits. They're the machines that make up your paycheck, do routine office chores and help the Census Bureau keep pace with our growing population. It's the analog computer that can be set up to simulate the flight of an airplane or missile or the flow in your sewer system.

Memories Are Similar

Regardless of their genealogy, all robots have pretty much the same kind of memories. Some store facts in magnetic drums (small, metallic cylinders with a sensitized surface. Data is stored in the form of magnetized spots, coded by mathematical symbols). Some have magnetic-tape memories—reels of sensitized tape very much like the tape of your home recorder. Some other types of memories are magnetic core, mercury delay lines, pulse emitters and electronic tubes.

Just as our own brains are multifunctioned, so too the robot's. In one memory device it stores the programmer's instructions. In another, long tables of equations and logarithms. In still another, it may hold all kinds of assorted data. When, heeding the programmer's bidding, these facts are needed, the robot puts them to work.

Robot Remembers Your Overtime

Typically, in figuring your paycheck, one memory stores such standard data as your company's hourly overtime rate. When your coded pay card indicates you've worked four overtime hours, the machine calls forth from its memory the hourly scale, multiplies by four—then stores this subtotal, ready to add to your basic salary when it summarizes your check.

Finally, the robot "talks" through its output system—spews out answers on punched cards, magnetic or paper tape, perhaps even delivers results in finished form—as paychecks, inventory listings, weather predictions or statistical briefs.

(Continued to page 222)

Announcing: nearly 100° of extra protection with new *MOPAR* "Hi-Temp" Brake Fluid



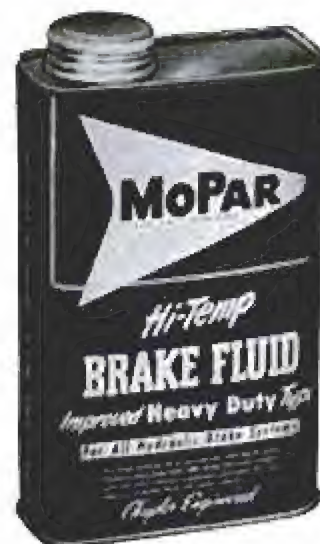
EXTRA SAFETY

Five years of grueling road tests, over mountain roads, in desert heat and in city traffic... five years of continuous research in Chrysler laboratories... these stand behind this news announcement of major importance.

Today's new MoPar "Hi-Temp" Heavy-Duty Brake Fluid stands up to heat nearly 100° higher than present specifications established by the Society of Automotive Engineers.

This "difference in degree" can make all the difference in safety, because the friction heat of braking can raise brake fluid to the boiling point—and bubbles in the lines can cause brake fading and failure. MoPar "Hi-Temp" means many extra degrees of assurance.

Next time, make sure you get this entirely new kind of brake fluid. Available at your Plymouth, Dodge, De Soto, Chrysler or Imperial dealer—or at leading independent repair shops.



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NEW! *Dish-Quik* REPLACES ANY THUMB-CONTROL SPRAY!

EASY TO INSTALL!



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SUDS, SCRUBS
and RINSES!**

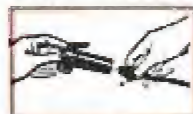
ONLY \$9.95 fair trade
Deluxe Replacement Unit—
attaches to your existing hose

Dish-Quik makes quick work of dishes and a dozen other kitchen tasks! Even scrubs out the sink—yet your hands never touch hot, soapy water! To spray-rinse with hottest water, just press the thumb lever; or, tap the button for an instant flow of rich, foamy suds. Uses any good liquid detergent; holds two-day supply. Rugged, all-nylon brush gets dishes, pots and pans really clean! Fully guaranteed.

**DO YOU HAVE A SPRAY THAT CAN
BE REPLACED WITH DISH-QUIK?**



The answer is "yes", if your spray has a thumb control. Almost all sink sprays do have thumb controls. These sprays come in many shapes; but they are all known as "automatic sprays", so-called because they spray automatically when the thumb control is pressed.



Anyone can replace any automatic spray. Simply unscrew the old spray, then...



attach Dish-Quik to the same hose.

Now it's easy to repair or replace any automatic (thumb-control) spray! Dish-Quik is one of the new, official replacements, standardized to replace any old or worn-out automatic spray. In addition to Dish-Quik, the deluxe replacement, you can also choose Rinse-Quik, the standard replacement, for rinsing only. Replacement hoses and accessories also available. If you do not have a thumb-control spray, you cannot use these replacements. You can, however, install a new kitchen faucet equipped with your choice of Dish-Quik or Rinse-Quik.

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Wherever Plumbing Goods Are Sold**

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All this superthinking is electron-fast. Some robots can multiply at the unbelievable rate of 2000 times a second. IBM's 701 computer does simple arithmetic 100,000 times faster than the best accountant. Some, like the UNIVAC 1103A Scientific, can store upwards of 20,000 "thoughts" in its magnetic-drum brain. Another IBM robot—used by the federal Joint Numerical Weather Prediction Unit—digests 400 wind and pressure reports every day, grinds through 10 million additions and subtractions in forecasting tomorrow's weather. The same job would require 10,000 meteorologists working ten days without sleep or coffee breaks.

Scientists, fascinated by their own brain children, have recently proved that not only can robots think, make simple decisions and remember—but they can also learn from experience.

They Even Play Checkers

Arthur Samuel, an IBM research adviser, has taught IBM's 704 computer how to play checkers. With the game's 10,000 possible moves tucked away in its memory, the robot sifts through every one of them in a matter of seconds, decides the smartest strategy. And if a move proves disastrous, it remembers, seldom again makes the same mistake.

Says researcher Samuel, "In two minutes I could show you, even if you've never played checkers, what to tell the machine so it could beat the average player."

How "smart" is the checker-playing 704? Well, unlike most of its human opponents, the robot looks ahead four moves. What's more, it'll allow its bungling flesh-and-bone adversary to take two pieces in a row so long as it can come back and make a triple jump!

Yet, notwithstanding many a viewer's amazement last election eve, even UNIVAC, among the largest of the million-dollar robots, turns "babbling idiot" if left to its own devices. It still takes a brain of the human variety to make a robot of the electronic variety behave. ★ ★ ★

Heat Pumps for Homes Now Work in Cold Regions

Available for use in very cold climates are heat pumps that draw warmth from the air, the ground or unfrozen water. Until recently, it was believed that heat pumps were feasible for heating and air conditioning homes and offices only in warm or mild climates. Heat is extracted and circulated through buildings in the same manner as a kitchen refrigerator draws heat from food and pumps it outside the food-storage area.

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No. M-300 Kit of Flat Bars 5 Pairs (10 Magnets).....	\$3.00
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No. M-35 Hobbyist assortment of 8 small magnets.....	\$1.50

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Give your portable drill some real authority... with a Supreme Versamatic... the reversible speed reducer that makes a drill 7 times more powerful—many times more versatile. Do the sort of jobs illustrated in the photos above. Do them easily, safely, accurately... with a Versamatic.

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DOUGLAS FIR PLYWOOD ASSOCIATION
Dept. 9, Tacoma 2, Wash. (Offer good USA only)

Fish the Little Lakes

(Continued from page 159)

three times a month throughout the summer at the rate of 100 to 200 lb. per acre at each application.

You can make a simple testing device to determine when your pond is fertile enough by fastening a white disk on the end of a broom handle. Mark the handle at 12 and 18-in. intervals from the disk and lower it in the water. If the disk cannot be seen at the 12-in. level, the pond is sufficiently fertile. If the disk can still be seen at the 18-in. level, add more fertilizer to the water. Fertilizer not only promotes insect-larvae production for bluegills' appetites, but it also prevents much of the sunlight from penetrating shallow water, consequently minimizing weed growth that makes fishing difficult.

One of the better features about controlled stocking of ponds is that the ponds should be fished heavily. When the big ones are caught, you make room for smaller fish to grow and take their place. Bluegills especially should be caught as often as possible and none should ever be returned to the water. A single pair of adult bluegills may produce 35,000 eggs. They're likely to overcrowd the pond and make life miserable for the bass by feeding on the latter's eggs. If this type of situation is permitted to get too far out of hand, there may be nothing left in the pond but a great many stunted bluegills and perhaps a few overgrown bass trying unsuccessfully to raise their young. A newly stocked pond can be fished the second year after it is stocked. This gives the bass ample time to produce their first crop of young fish. ★ ★ ★

Magnetic Fields May Help Recapture Satellites

Satellites may be successfully recaptured and the thrust of rocket motors improved as a result of work in a new field of study. Dr. William R. Sears of Cornell University has described some of the work in this field. When objects pass through air at extremely high speeds, the atoms release free electrons, and the air then becomes a conductor of electricity. If the conductivity in this ionized air can be further increased by seeding the air with an easily ionizable substance, magnetic fields can be provided in flight. Such a field could be used to slow down a missile or satellite as it entered the atmosphere. It could also be used to accelerate hot gases in a rocket engine.

Smooth Lawns everywhere begin at drafting boards in Lamar, Mo.!

Mowing makes any lawn . . . determines whether it's beautifully smooth or ragged. But how do you get the kind of cutting that makes any lawn parklike?

Engineers of LAWN-BOY Power Mowers at Lamar, Mo., have solved that problem—by tailoring every integral LAWN-BOY component to one function: helping the blade cut with utmost efficiency.

Take the husky 2-cycle LAWN-BOY engine—made by LAWN-BOY. Its job? To deliver maximum cutting power to the blade. How? by providing more power per pound through utilizing fewer parts. By perfect pressure lubrication without oil changing and checking—through pre-mixing oil and gas. By starting instantly because it has the hottest magneto spark of any power mower. By running 100° cooler to reduce power losses, friction, and wear. It recovers

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Instant recoil starter—with long-life nylon cord—starts engine with one easy pull.

Low front deck (and side-mounted engine) allows LAWN-BOY to cut easily under bushes.

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Featherweight aluminum die-cast housing gives LAWN-BOY both unequalled maneuverability and tank-like toughness.



Simple adjusting arm gives you five cutting heights. Just lift or lower arm to height desired.

Tailored design makes LAWN-BOY the leading power mower, not just a power plant with a blade. Tailored design, by LAWN-BOY, gives you level cutting with a minimum of time and effort from you.

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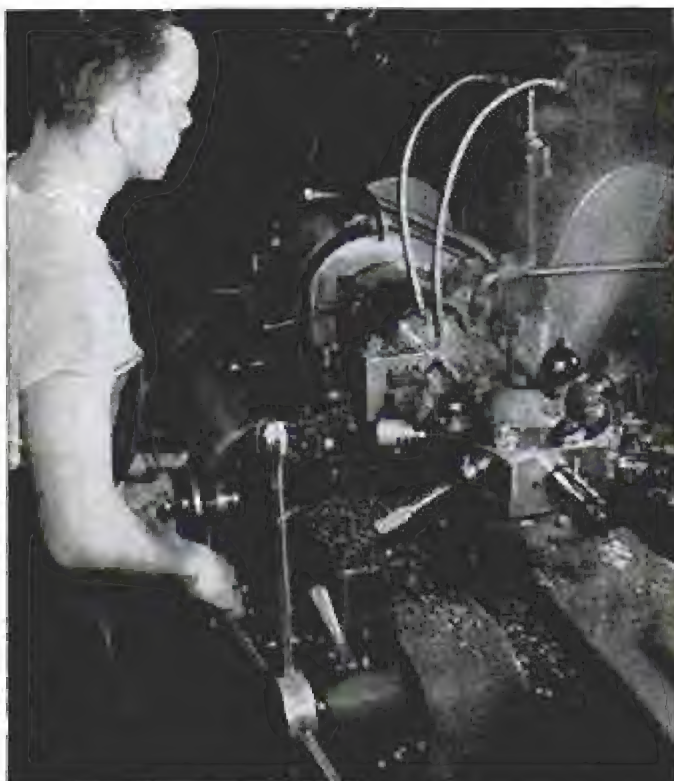
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Turret feeds	hand	144	144
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months to pay.

The Changing Face of the Philippines

(Continued from page 112)

belt, burned to the ground not long ago, but within five months this boom town of the south rose from its ashes, finer than ever. Sugar built this wealthy region, and the sugar barons of Negros Occidental are mighty powers in the land. But sugar is an old industry, and reactionary practices and growing U. S. quota restrictions demand that the young dons roll up the fine sleeves of their barong tagalogs if they would weather the rocky years ahead.

Plywood Production Spurts

Plywood production has grown 200 times over since the war, and its quality can compete in world markets. Gaudencio Manalac, a Davao frontiersman, started three years ago. Today he exports two million board feet a month, logging on a 50-year cycle so his forests will have perpetual yield. He pays his choppers 2 $\frac{1}{2}$ cents per inch of tree diameter, and the drivers who negotiate his abominable logging trails get only 3 $\frac{1}{2}$ cents a mile. The nation's \$25,000,000,000 timber wealth is efficiently protected by a smart forest-management plan that enforces a selective-yield logging.

Philippine "Tobacco Road"

The national highway from La Union to Ilocos Norte is Tobacco Road, and the boom is on. Teodorico Baduria now puts in Virginia Leaf after his rice harvest and makes eight times the amount that rice used to bring him. Frugal Ilocanos aren't buying flashy cars, but put their money in enduring land. Since 1952 tobacco has swelled from 100,000 to 60,000,000 pounds. The well-run Tobacco Administration is erecting hundreds of the flue-curing barns that small farmers can't afford, plus Agoo's \$2,000,000 cooperative redrying plant whose super redryers are the world's only pair except for similar twins in the U. S. Every eight-hour shift this giant spews out a lusty 90,000 pounds!

Government Starts a Boom

The farm boom was sparked by an energetic government dedicated to free enterprise, and steered by the fiscal wizardry of Governor Miguel Cuaderno of the Central Bank. David Grove, Bank of America's chief economist, lauds Cuaderno's clear vision and technical virtuosity" and flatly states that "wherever experts gather to discuss . . . economic development he is regarded as a man with few peers." Last fall Cuaderno became Asia's first chairman of both

(Continued to page 228)

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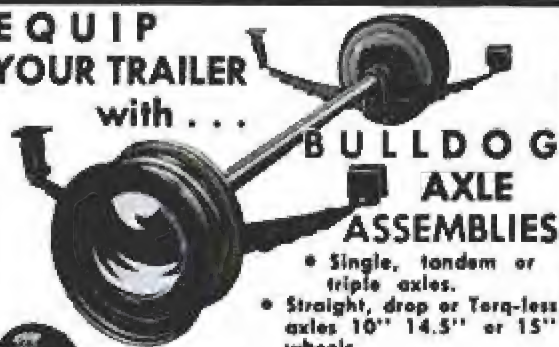
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the International Monetary Fund and the International Bank for Reconstruction and Development.

Cuaderno is scored by the loose-money boys who dislike hard currency and high prices, but so far he has enforced the firm fiscal policies that spell lasting prosperity. Friends of Philippine progress hope he can keep it up.

Oil Could Really Boom

Oil is the open sesame of Philippine prosperity. Lady Tumauini Number One went off strata at 10,000 feet in Isabel, but on a nearby ridge overlooking the broad Mallig Valley drillers are feverishly pushing Tumauini Number Two through the oil-rich soil. Leocadio Ignacio was a lieutenant who went guerilla with Blackburn's Headhunters during the occupation, good training for mayor of a municipality with 14,000 hard-bitten constituents and one lone cop. Men of Ignacio's stamp are building the oil country of the north, where the nearest neighbor may be as much as half a day's hike away.

A hundred miles from Tumauini, Stanvac's Faire Number One is probing the wild Cagayan Valley, where the women roll their own foot-long stogies that take three days to smoke. Eleven other companies are exploring, and the Bureau of Mines tells excitedly of 27 seepages in 14 provinces where oil oozes into black pools on the surface. A 50-million-barrel strike would end controls and catalyze myriad new industries hungry for foreign exchange. The keen eyes of many a Philippine financier are fixed on those slender holes that lance Luzon's northern hills.

Base Metals Outranking Gold

Hidden in the craggy Philippine hills is the wealth of the Indies. Once gold from Benguet's mountain mines was king, but in 10 years base metals have swelled 130 times. The most-wanted metal in the U. S. today is said to be nickel. The U. S. has found 550 million tons of nickel-bearing laterite in the P.I.—world's fifth largest source. Surigao's rich billion-ton iron deposit is one of the largest in the world. Atlas Consolidated's 10,000-ton daily copper operation is largest in the Far East, with Lepanto close behind. Palawan Quick-silver, incorporated in late 1954, boomed swiftly to the big board. Vice Commander Carlos Albert of the Navy, who tramped lots of dry land as Roxa's wartime guerilla contact, told me, "Bill, you can ladle the mercury right off the ground!" And most pulse-quickeners of all is the news of uranium in Camarines Norte!

Japan's steel plants need seven million tons of ore a year. She gets 1.5 million from the Philippines, and fully seven missions have come to the P.I. lately trying to double this figure. Filipinos watch with mixed emotions, looking to the day when their own integrated steel industry can feed the factories of Asia.

Steel Industry Grows

Dynamic Bernado Abrera, Massachusetts Institute of Technology graduate who heads the government's National Steel and Shipbuilding Corporation, set this vision on the road to realization when he tapped a molten ladle last year to signal completion of the \$25,000,000 Lanao steel mill's first big expansion. NASSCO smelters will go near the mines; the first two are on order from Norway and Belgium. Steel makes sense here, with ore, limestone, manganese, chrome, coal and charcoal available—and abundant potential hydroelectric power.

Crying Need for Kilowatts

The government is moving to meet the cry for kilowatts. The \$65,000,000 Ambuklao, most massive rock-fill dam in the world, went on the line last year. Maria Cristina was completed in time to power NASSCO's new Illigan furnace. The \$50,000,000 Binga project on the Agno River will feed in another 100,000 kilowatts, and from Lake Mainit a three-kilometer tunnel will lead through a mountain to the thirsty turbines. Even atomic power is in the offing: a Raytheon study predicts that by 1960 the P.I. will rank sixth in world production, after Britain, the U. S., Russia, Czechoslovakia and France!

The Philippines may be the land of Moro outlaws, of rice terraces which were old when Christ was born, of storied Zamboanga where the monkeys have no tails. But she is a modern sovereign power, too, impatient for her rich land to fulfill its destiny athwart the many trade lanes of the East.

The Little Giant of Southeast Asia is on the march! ★ ★ ★

Discover Perfect Flow In Liquid Helium Superfluid

Using a special liquid helium as a superfluid, two California Institute of Technology scientists have discovered perfect flow, in which there is no viscosity and therefore no resistance. They tested fly wings as well as manmade wings of mica, Pyrex, quartz and wood in the superfluid, which exists only at temperatures near absolute zero, 459.6 degrees below zero Fahrenheit.

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...it's still gleaming-bright 6 months later"

says Charles J. Rockwell, of Paramus, N. J., after waxing his '56 Plymouth with Du Pont New Car Wax. "Rocky" found that this new paste wax is as easy to use as a liquid polish, because it cleans, waxes and glazes—all in *one easy application*. And it protects with real Carnauba wax, *the toughest wax known*. Proof of protection is the long-lasting gleam. Six months, 10 car washings later, the finish still shows clear reflections of "Rocky" and his wife! Try Du Pont New Car Wax—it makes any good finish look new. At service stations and auto supply stores. Only \$2.00.



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Ski-bike has honeycomb frame of Philippine mahogany and is designed to keep two average adults afloat



Even small children can operate the water vehicle which has aluminum handle bars to steer the rudder

Handle Bars Steer Rudder For Water Ski-Bike Rides

Now you can water-ski from a sitting position. Built of Philippine marine mahogany and designed to float with over 300 pounds of weight aboard, the water ski-bike is pulled through the water on a 75-foot tow rope by a powerboat. The bicyclelike handle bars not only provide a handgrip for support but connect with a steering rudder under the skis. If the rider spills, the towing hook releases automatically and the ski-bike stops about 10 feet away.

Microbes May Play Big Role In Recovery of Metals

Bacteria's presence in small samples of ores has enabled U. S. Bureau of Mines researchers to extract many times the amount of metal that could be recovered without the bacteria. Experiments show that the bacteria oxidize sulphur contained in the ores to sulphuric acid, releasing the free metal.

☐ All water vapor on Mars, if concentrated to the humidity of our atmosphere, would fit in a space of 40 cubic feet.

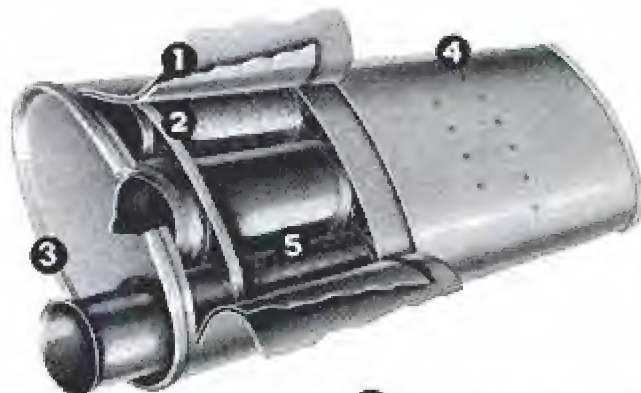
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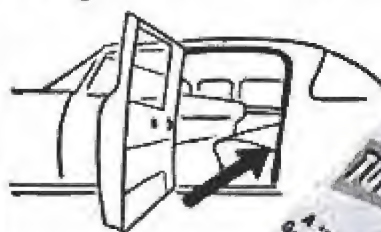
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Delta

FLASHING
POWERTOP

Teach Bicyclists How to Live

(Continued from page 126)

complete control of the wheel in tight places," Horan explains.

Signaling and stopping again at the end of this run, the applicant proceeds to a typical street intersection, marked out on the ground, where a manned traffic light (made of an old box, coffee tins, a length of pipe and wooden base) may give him a green or red light. In either case, using a hand signal for stop or turn, he follows the traffic signal just as an automobile driver would, moves through the intersection and swings around to make another pass.

Toughest event is the "figure eight." This set of twin circles 28 feet in diameter is delineated by double white lines, only 18 inches apart. The applicant must move into the 18-inch space between the lines, signal, and stop. Then, starting without allowing his wheels to wobble over the lines, he swings twice around the "eight."

Road-Test Approval

Before leaving the course, the rider enters another intersection with a stop sign, where he again must signal, stop, dismount, remount and give a hand signal for a turn that brings him up to the approval desk.

In some communities, other tests recommended by The Bicycle Institute have been added. One, a 30-foot path eight inches wide, marked with boulders, teaches the cyclist to stay clear of nearby obstacles by watching the uncluttered part of the road. "The tendency of novices," according to the Institute, "is to steer where they look. If they look at the rocks they'll usually hit one." Another Institute favorite is to set up a sawhorse, have the cyclist ride toward it and stop within 10 to 14 inches of it at varying speeds. Object: To give him a precise knowledge of braking distances.

Also Learn What Not to Do

At the road-test approval desk, each applicant gets a true-false examination covering the important "do's and don'ts" of bicycling. Riding three abreast, for instance, is a forbidden, hazardous practice. Riders are also warned to ride a straight line and to avoid weaving at all times.

Bike law calls for a white light in front and a danger reflector in the rear. It also advises the use of white garments for night riders. "Most night bike collisions happened because automobile drivers had no inkling a bike rider was ahead."

Pedestrians get the right of way, and cyclists are expected to know that they must avoid sidewalks.

(Continued to page 234)

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Model MC-28
28"x9"x8"

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Another bugaboo for the unalert bicyclist involves parked cars. "The youngster who doesn't keep a sharp eye peeled for cars pulling out into traffic, or doors being flung open suddenly on the driver's side, sooner or later is going to smash up," warn the experts. Seven youngsters wound up with cuts and broken bones in White Plains in a recent year from just such causes. "Riders are warned to use extreme caution when entering streets from driveways," DeLanoy adds, "and always to keep a sharp lookout for cars backing out of driveways on residential streets."

One of the worst sins, an applicant learns, is to carry an extra passenger on his single-seater. The high national incidence of accidents from this cause is enough reason to emphasize it. "Extra weight," the experts point out, "will change the entire handling characteristics of a bicycle, depriving the driver of any semblance of control in a tight spot."

Stunting or racing in traffic is prohibited, as is hitching rides on the backs of trucks. "The sides and back of any automotive vehicle are blind spots in the driver's view," says DeLanoy, "and therefore dangerous."

Most other "rules of the road" are the same as the automobile laws, and every applicant for a bike permit is obliged to know and obey them just as though he were behind the wheel of dad's car. What happens to bike riders who break the law in White Plains? They may be issued a warning, and a letter may go to the parents. In the case of serious or habitual offenders, police may impound the bicycle for a given period. "We haven't had to do that yet," DeLanoy boasts. By the time he's finished the road-test course, an applicant has revealed his knowledge of traffic rules and signals. If he passes the written test, he gets his permit to cycle, and a metal license plate is hooked to his bike. The numbers are logged in police files, with the bicycle's frame serial number, and he's ready to roll.

But basically, the fact is that White Plains bicyclists are among the world's best—in or out of traffic. Today, in that town, you'll see a 10-year-old brake up to an intersection on his wheel, signal for a stop and hold his bike upright without a waver. Then he'll signal his turn and swing steadily in that direction.

"Recently," says Horan with a satisfied smile, "my wife and I were driving downtown and saw a boy do just that at a stop-sign intersection. 'Maybe,' my wife said to me, 'these kids will even teach some adults how to drive.' And you know, I think they will."

★ ★ ★

Can We Shoot Down Missiles?

(Continued from page 79)

studied. An atom bomb in the defense rocket seems the best solution, though not because of the bomb's blast and heat. An atomic explosion at high altitude is weak, for the air is too thin to sustain a destructive shock wave. And the warhead would flash through the atomic fireball in a tiny fraction of a second, hardly long enough to raise its temperature materially.

Instead, the neutron radiation from the exploding bomb is expected to trigger the fissionable material in the warhead and set it off. There would be a double explosion high in the atmosphere. Undoubtedly the Atomic Energy Commission will be testing this theory soon at its Nevada or South Pacific test sites.

A different suggestion is to use the defense missile to scatter clouds of sandlike particles in the path of the warhead. Even a grain of sand can have a damaging effect at extremely high impact velocities. Such pellets might pierce the warhead and destroy its mechanism, or allow heat to enter and burn up the interior. Various other ways of destroying a warhead also are being studied.

After radar was first developed it wasn't long before radio experts found ways of jamming it. They named their techniques "ECM," for "electronic countermeasures." Then antijamming techniques were devised for radar, and now the ECM people are studying ways of overcoming these elaborate improvements.

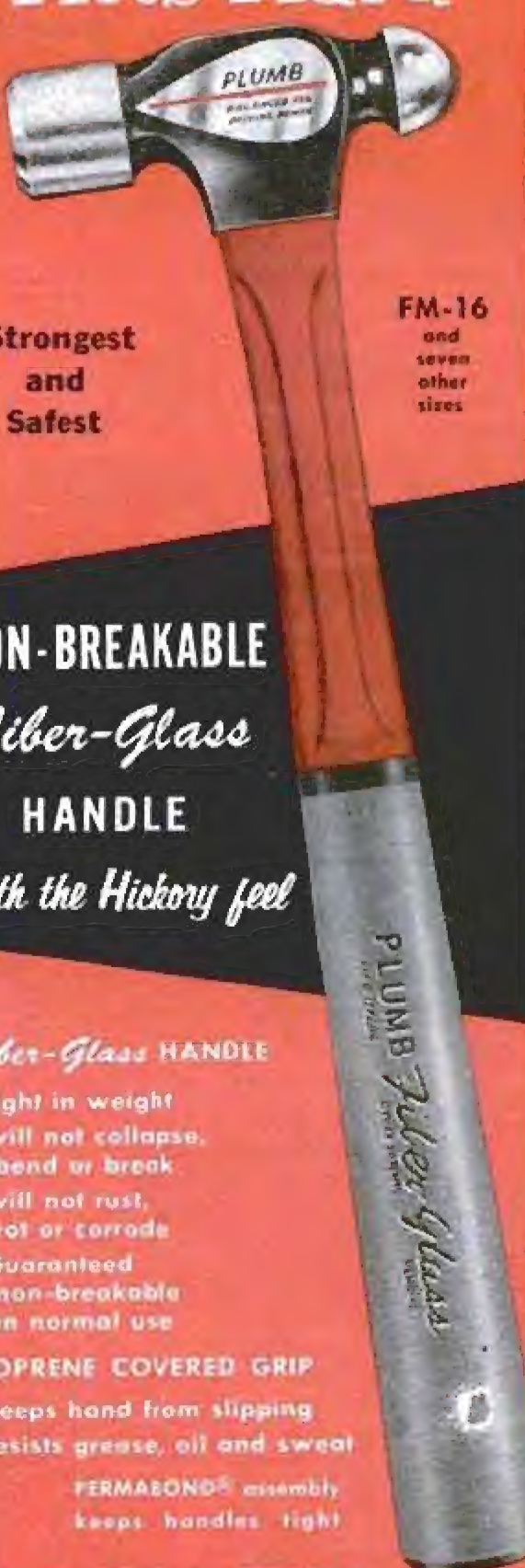
It's the same with missiles. The United States is developing long-range ballistic missiles and at the same time is designing antimissiles to shoot down the long-range missiles of an enemy. And, under cover, the military forces are studying anti-missile techniques. We don't want our own long-range missiles destroyed by an enemy's antimissiles! ★ ★ ★

Embossed Projection Screen Permits Movies in Lighted Room

Now you can view home movies or slides in fully lighted rooms. A newly developed projection screen is embossed with millions of tiny lens-shaped elements which reflect images with twice the brilliance of conventional materials. The new screen surface also provides better viewing over a wider area than was possible previously.

❏ Perfecting a method of quick freezing cream for export has enabled a British firm to serve markets in Africa, the Far East and the West Indies.

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and
Safest**

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sizes**

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HANDLE
-with the Hickory feel

Fiber-Glass HANDLE

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- will not collapse, bend or break
- will not rust, rot or corrode
- Guaranteed non-breakable in normal use

NEOPRENE COVERED GRIP

- keeps hand from slipping
- resists grease, oil and sweat

PERMABOND® assembly
keeps handles tight

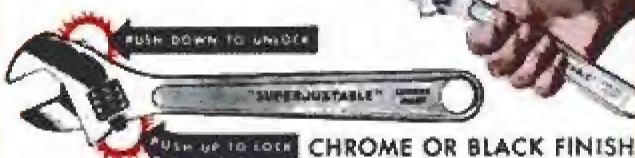
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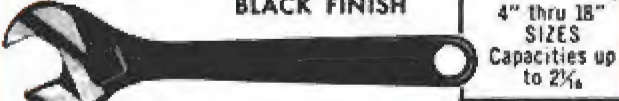
WILLIAMS REGULAR SUPERJUSTABLES

CHROME FINISH



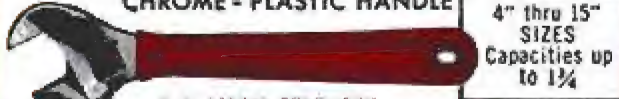
4" thru 24"
SIZES
Capacities up
to 2 3/4"

BLACK FINISH



4" thru 18"
SIZES
Capacities up
to 2 3/4"

CHROME - PLASTIC HANDLE



4" thru 15"
SIZES
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Made by
Minnesota Mining & Mfg. Co.
St. Paul 6, Minn. ©3M Co., 1958

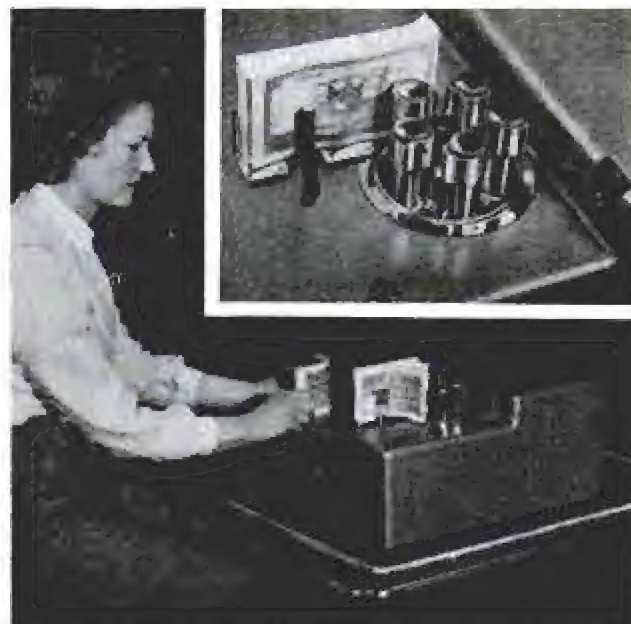


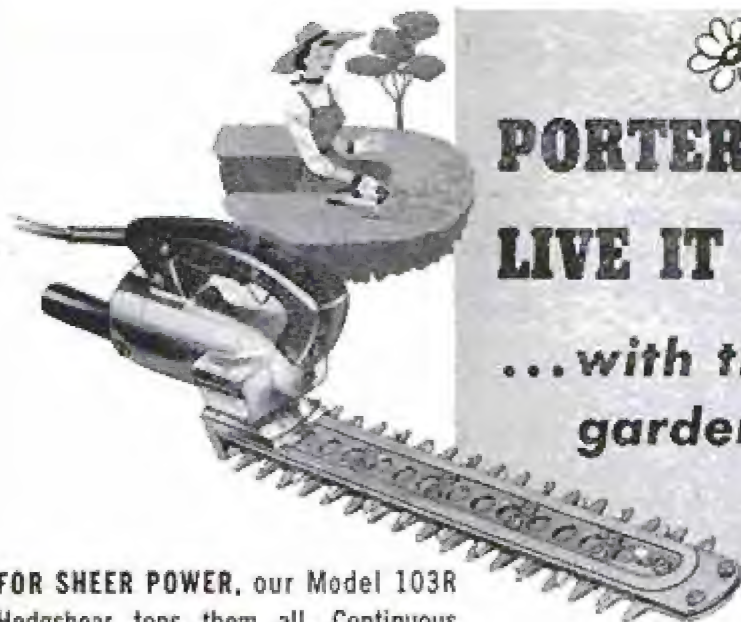
Switchboard Recorders Tape Telephone Calls

Four incoming telephone calls can be recorded simultaneously by the operator of a switchboard in an East Berlin radio station. The tape recorders are mounted on a circular console in the station's newsroom. The calls can be relayed from the tapes to the appropriate editorial offices.

Machine's Five "Fingers" Can Count Currency

Place a bundle of currency on a machine developed in England and it will count the banknotes at a rate of 14 per second, tabulating the exact number on a revolving drum. The money is peeled off the bundle by a series of five hollow stems which are activated by a vacuum pump. As each banknote is taken, an electric contact energizes a magnet in the counting mechanism and a new figure appears on the drum. The fingerlike stems are mounted on a rotating disk.



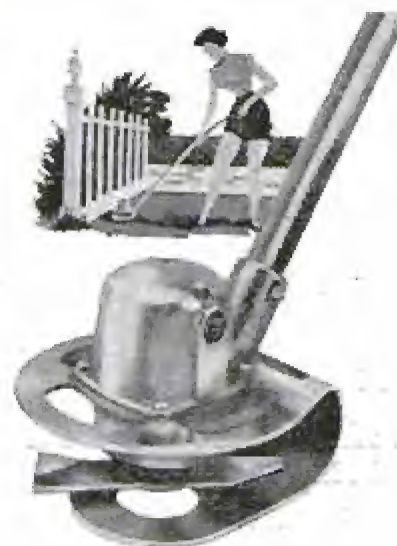


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Power brakes won't stop a car any sooner, only with less effort. The brakes are the same whether power or not, only the push is different.

He should move up North and try sliding under the wheel in midwinter wearing a heavy coat!

Someday, somehow, stylists will solve the glove-compartment dilemma. Owners have complained about this since the horse went out of style. One solution (too simple, perhaps) would be to start with a good glovebox and design the rest of the dash around it, instead of vice versa as it's done today.

Twice, the wiper switch refused to shut off the blades. Finally after five minutes of wioing with the switch off, they suddenly stopped.

Miscellaneous comments: Dashboards, like picture frames, should be as "invisible" as possible—the dials are what you should see. Pontiac's dash is so flashy that instruments come off a poor second. The dials are so deeply recessed that the needles are hard to read. The clock is useless to the driver. Gas-tank filler pipe is hidden behind a hinged door beneath a taillight. A fine styling trick, but as impractical as imaginable. When you run out of gas you need a foot of flexible hose to pour gas into the tank. If stylists ran out of gas just once, they would be more practical about things like this. Side sculpturing may be handsome, but seems to catch dirt more readily than flat sides and, when dirty, is more obviously so.

And More Complaints

These quotations describe additional complaints, in order of frequency of mention by the owners:

"Could have better paint job. Some places don't have enough paint to cover primer."—Ohio worker.

"My only complaint on this Star Chief is the rust spots on the body."—Michigan superintendent.

"I do not have power brakes, but the standard brakes have a hard time stopping. I believe there is too much car for the brakes. The dealer says they are okay."—California inspector.

"Some trouble with front brakes grabbing."—Kansas railroad worker.

"Carburetor seems to flood. Can't seem to be adjusted right. These engines are supposed to be tuned by machine, not by sound and ear. But the usual adjustment for a flooding carburetor is a piece of pipe to hit it to unstick it. No skill needed."—Florida highway-patrol employee.

"Short space between steering wheel and seat interferes with ease of getting in and out."—Florida retired physician.

"Put the heater under the seat where it was before."—North Carolina truck driver.

"Heater doesn't warm rear seat."—Indiana inspector.

"Don't like dealer service. I was misled by him. My 2000-mile service contract was removed from the manufacturer's guarantee before it was mailed to me. When I went to get this service I found that I had no service guarantee."—Georgia instructor.

"Not quite enough headroom in front, not enough legroom in rear."—Michigan toolmaker.

"You have to stand on your head to get into the glove compartment."—Ohio executive.

"Trunk leaks. Until it's fixed I won't be able to take advantage of that big trunk. A friend of mine also has a Pontiac. We both have trunks that are wet and soggy every time it rains."—New Jersey owner.

"Windshield-wiper control doesn't work half the time. Don't like its location."—New York owner.

"Overhang at the rear is such that tailpipes and often the gas tank hit when going out drive or ramps."—Connecticut college executive.

"Too close to the ground. I go over a lot of bumps and the back drags. Had to pay for repairing gas tank already."—New Jersey plumber.

The following miscellaneous complaints are of interest although they were mentioned by only a few owners each:

"They should never install electric clocks in any car. They never work right."—Illinois superintendent.

"Middle of rear seat is hard and uncomfortable on long rides."—Massachusetts foreman.

"Location of gas-tank filler tube is such that it assures a waste of gas every time you fill up. Service-station men complain about it."—Colorado owner.

"Windows in this four-door hardtop crank up and down very hard."—Indiana salesman.

"Designers should have recessed parking lights in front bumper more. Have had two lenses broken already while parked."—Illinois salesman.

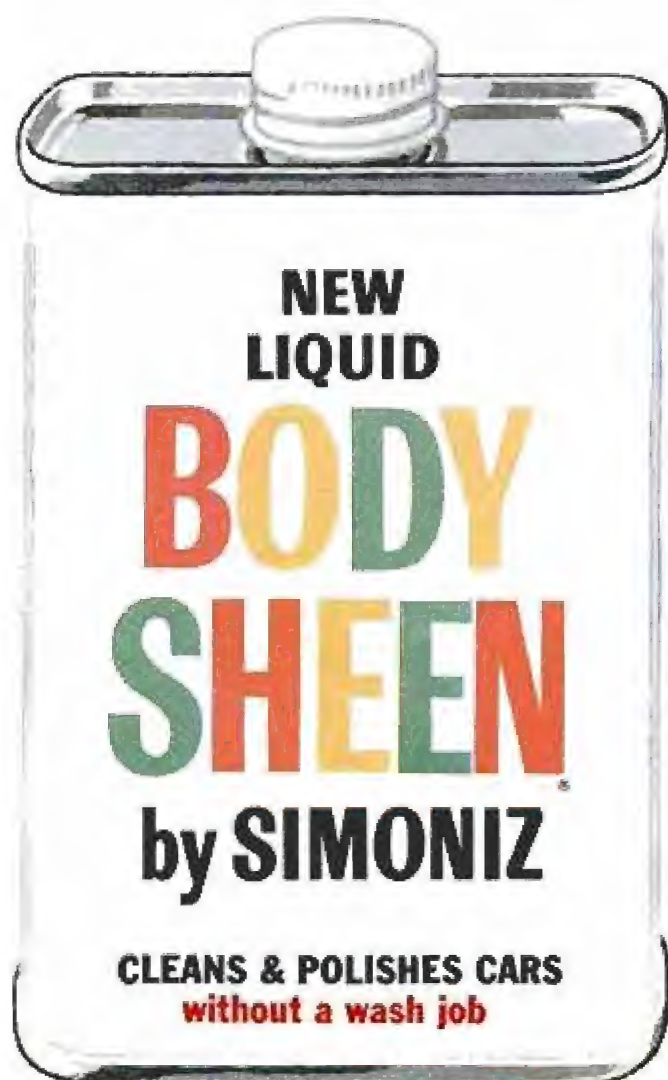
"Hard to change gears on handshift model, due to poor linkage on steering column."—Florida owner.

"Don't like coil springs in rear. Car has some rear-end sway that I don't like."—Iowa owner.

That's it, the good and the bad about the 1958 Pontiac. The engineer's report by Dale Kelly is on page 88. ★ ★ ★

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Mouth Wand Moves Blueprints For Paralyzed Engineer

Paralyzed by polio, James K. Nason of Long Beach, Calif., still works as an engineer and estimator for a construction company. Able to move only his head, neck and fingers of his left hand, Nason, a graduate of the California Institute of Technology, reads blueprints held in an aluminum frame. The blueprints are moved by small motors which Nason controls with a mouth wand. The device was invented by a friend, Robert Morford, who used motors and remote control buttons from toy Jeeps.

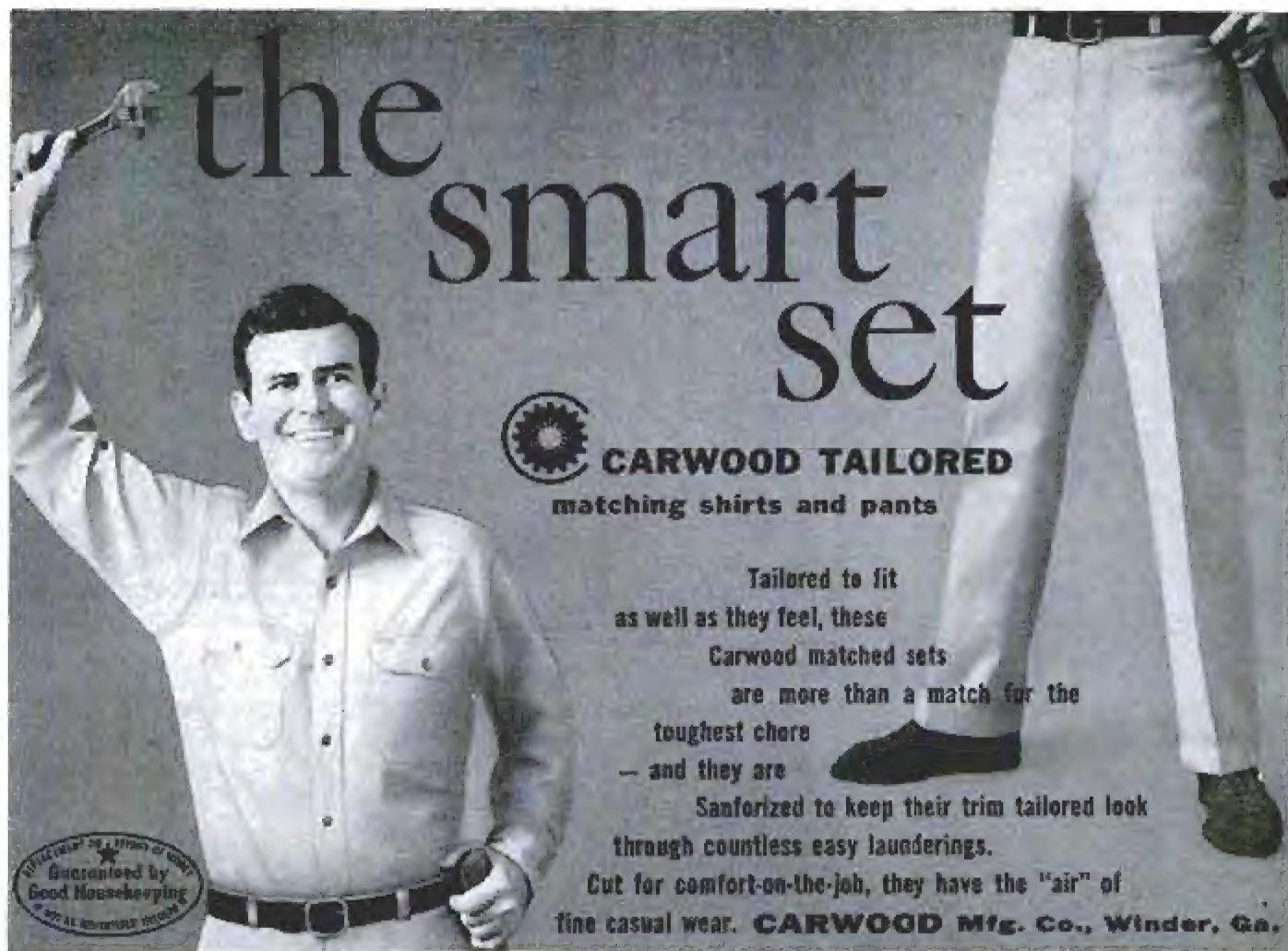
Mobile Welding Shop

Both electric and gas-welding apparatus can be moved to the job site in a compact unit built by Delotcha Butler, of Washington, D. C. Butler spent approximately two months converting a 1952 Crosley truck into the mobile welding shop that weighs slightly over one ton.



❶ You, who have been brought up on tooth powder and toothpaste in tubes, can now buy dental cream in an aerosol "push button" container.

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Stand By for Major Earthquake

(Continued from page 82)

Requirements like these make a tremendous difference. Everyone who visited the Bakersfield-Tehachapi area after the 1952 quakes saw that the newer buildings, conforming to the code, suffered little or no damage even though they were next door to older structures that were completely destroyed.

Los Angeles has gone even further. Several years ago a retroactive law to make old buildings safer was pushed through by Gilbert Morris, head of the Los Angeles department of building and safety. The law calls for the removal or strengthening of tall parapet walls around the sides of roofs, and the removal of ornamental projections that are located above public walks and entrances. The law is based on the observation that thousands of tons of debris are tumbled from buildings into the streets during a heavy quake, with more left hanging, ready to topple over. Most deaths from an earthquake occur when people run out into the streets and are then struck by material falling from the buildings.

Death-Trap Schools Replaced

Half a million tons of parapet walls and ornamentation have been removed from

3696 office buildings and other commercial structures in Los Angeles as a result of the new safety law. Corrective work is proceeding on 1900 other structures.

The result is that all of downtown Los Angeles and many of its outlying shopping areas are now considered far safer in an earthquake than previously. Other cities enforce similar earthquake safety laws.

The Long Beach earthquake of 1933 and the Bakersfield quake of 1952 proved that many schools are actually death traps. Parts of the structures toppled into the exits that children would have been using had the quakes occurred during school hours. There was other extensive damage. Because of these lessons, many old school buildings have been torn down and replaced by safer structures. But engineers are unhappy about many of the other old school buildings still in use. One opinion is that possibly half of the schools in Los Angeles alone still need some corrective work. Engineers and seismologists are urging that such structures be strengthened as soon as possible.

One modern trend in architecture has created a new earthquake hazard. Most new office buildings are literally walled with glass windows. These windows can splinter and rain down in lethal showers,

(Continued to page 244)

Faster, safer way to wash your car



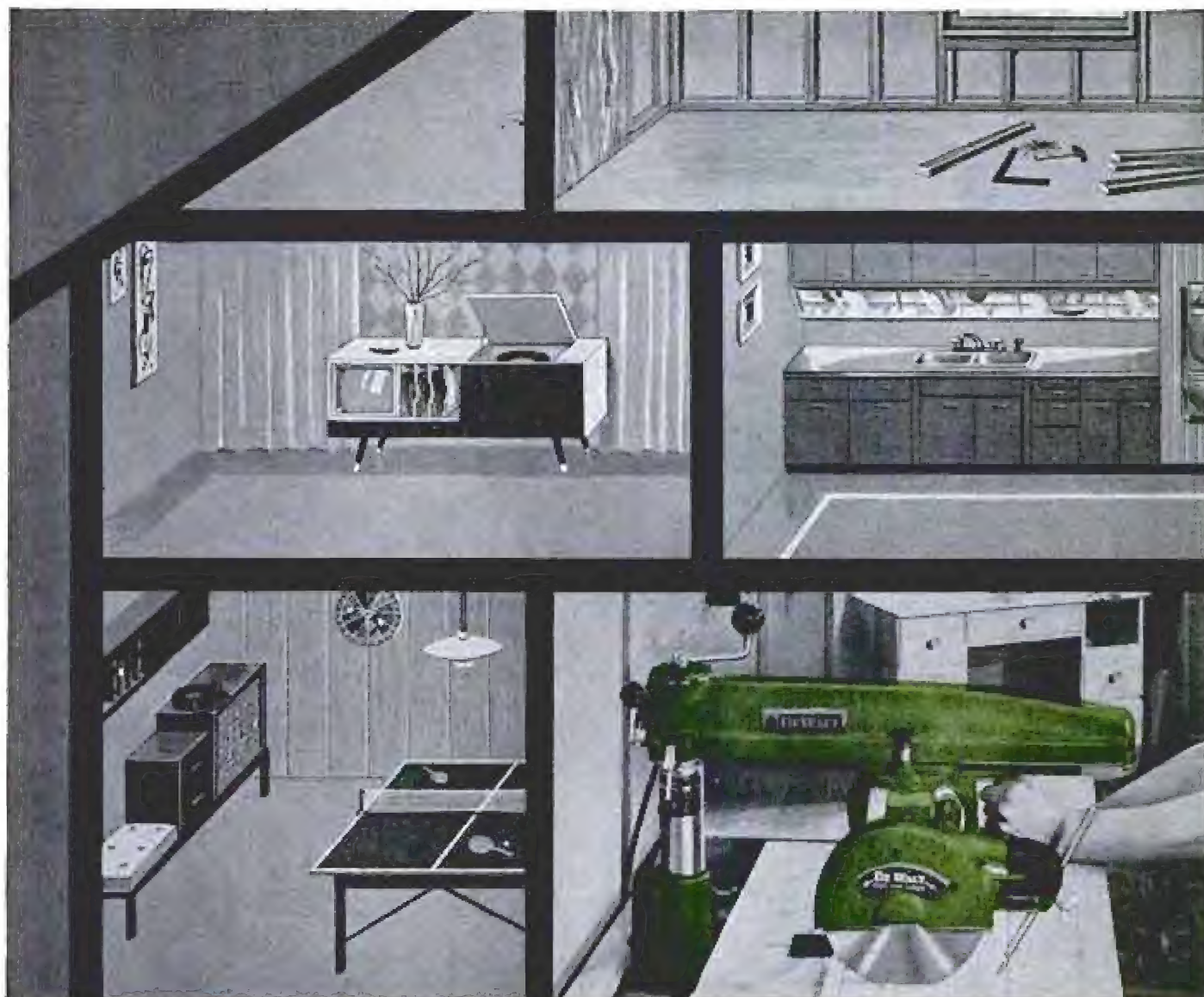
Du Pont Car Wash gets your car so clean it drains dry, without *wiping*. Unlike ordinary detergents, it's safe for wax and it doesn't streak! At service stations and auto supply stores— $\frac{1}{2}$ -lb. can only 75¢.



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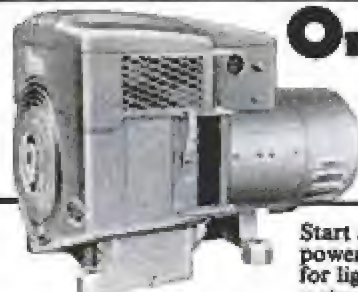
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as was learned in the 1957 quake in Mexico City. In California today measures are being considered for some sort of protection.

Machines Record Building Strain

On the UCLA campus stands a four-story reinforced concrete building that houses the school's engineering department and that also serves as an instrument for measuring quake effects on buildings. Eighty strain gauges are buried at various points in the structure, all connected to recorders. Whenever a heavy earthquake occurs, a strong-motion seismograph automatically turns on the recorders. A written record of the strain imposed on the building is obtained. For other studies, artificial earthquakes are produced by a "building shaker" that consists of three out-of-balance flywheels mounted on a single shaft. When this device, on the roof, is rotated, the building can be rocked back and forth a full half inch.

Considerably larger artificial earthquakes are being created for research. When the AEC detonated an atomic bomb underground in Nevada the resulting seismic waves were picked up by instruments in most parts of the Southwest, and these records are being studied.

Last year, too, the Naval Ordnance Test Station at China Lake, Calif., created huge underwater blasts in Mono Lake, in cooperation with several universities and as part of the International Geophysical Year. As much as three tons of high explosive were detonated at a time. The resulting earthwaves were picked up by geophones and seismographs.

What's Under Earth Crust

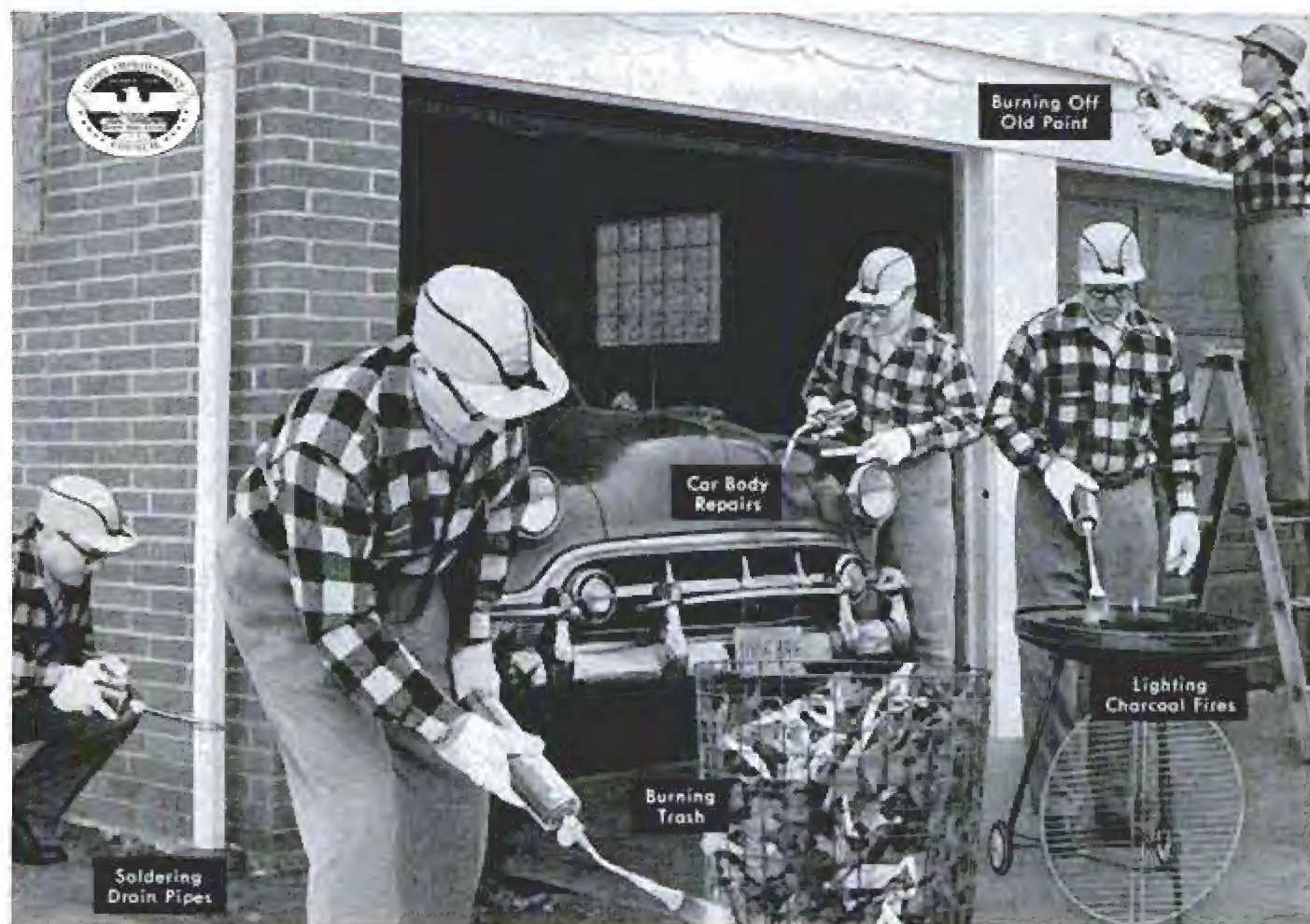
Some of the seismic waves from a quake, either natural or manmade, radiate outward along the surface of the ground. Others strike downward and are reflected or deflected when they hit discontinuity zones deep in the earth. By studies of such waves, considerable information about the structure of the earth is obtained.

Scientists are pretty well agreed that the earth's surface or crust is of the order of 20 miles in thickness. In the past it had been assumed that mountain ranges and high plateaus had roots reaching down 40 miles or more, but recent studies that were undertaken as part of the IGY program suggest that the crust under elevated portions of a continent is about the same as elsewhere.

Below the crust is an 1800-mile deep mantle of rock, under such heat and pressure that it has the capacity of moving, or flowing, at extremely slow speeds. Under

(Continued to page 246)

Sears New Flame Tool Kit makes spring chores easy!



CRAFTSMAN PROPANE TORCH KIT

You can use your Craftsman Propane Torch Kit indoors or out: setting tile, soldering, making jewelry, refinishing furniture, splicing wire, making toys, plus wire sculpturing and hobby work.

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Buy this Craftsman Torch Kit at your nearest Sears Retail Store or Catalog Sales Office or through Sears Catalog at home, by mail or phone.

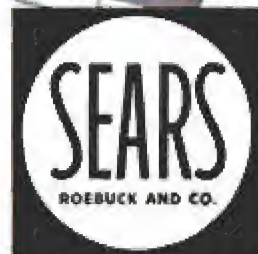
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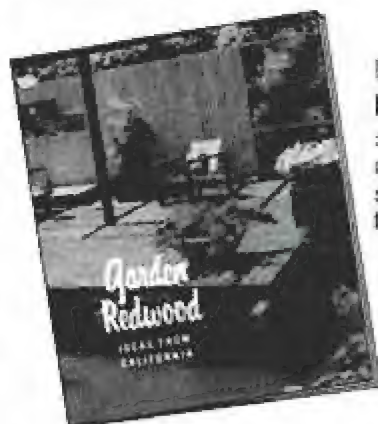
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the mantle is the core of the earth, so hot that it is presumed to be in a liquid state. The innermost 790 miles, however, are considered to be solid because of compression.

Radioactive heating not only maintains the heat of the earth's core but causes portions of the mantle to flow upward in some places and downward in others. This snail-paced churning, among other factors, puts strains on the relatively brittle crust. These strains in turn produce earthquakes. Being plastic, the mantle below the crust is not subject to earthquakes.

No one has yet found a way of accurately predicting when an earthquake will occur, though Caltech seismologists hope a new instrument they are using may eventually lead to accurate forecasts.

The new device is so sensitive that it can record a strain of one part in 100 million—equal to a one-inch squeeze between the two coasts of the United States. The instrument consists of a 79-foot length of two-inch fused quartz tubing that is installed in a tunnel in a granite mountain near Glendora, about 25 miles from the San Andreas fault.

The tubing is held in the tunnel by a number of flexible supports, with one end rigidly fixed to a pier sunk in the rock. The other end is free to move, and any movements are amplified and recorded by electronic apparatus. Any such movements, of course, represent contractions or expansions in the granite itself.

The instrument is called a secular linear-strain seismograph. Among other things, it is able to measure the tidal strains in the crust produced by the sun and moon, and measure and record long-period seismic waves that are not detected by other types of seismographs. Over a period of time it will indicate the strains accumulating in the rock at its location. Eventually, with a network of such machines and with new knowledge gained from operating them, the time and place of a future earthquake may be predicted with accuracy. ★ ★ ★

Big Hydroelectric Project To Serve Suriname

In a joint venture, the Suriname government and the Aluminum Company of America are planning the construction of a huge hydroelectric project. Suriname formerly was known as Dutch Guiana. The project, to be started in 1960, will include a dam, powerhouse and transmission line supplying 150,000 kilowatts. Alcoa will use part of the power to operate a 60,000-ton aluminum smelter.



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A thorough knowledge of power tools and how to use them will enable you to perform hundreds of major and small projects around your home at tremendous savings, and increase its value significantly. Now, with the aid of "Getting Started with Power Tools," it's easy, fun, safe... to do more home remodeling and repair jobs, make beautiful furniture, toys and boats, or execute other more ambitious projects you have wanted to do, but never could. This remarkable book, in 100 pages of easy-to-understand text and scores of illustrations, shows you all about the interesting and profitable avocation of working with power tools. Special attention is given to the type of learning problems encountered by the novice. Each major type of power tool is illustrated with captions showing all its parts. But this book is written for the skilled craftsman as well. It tells what you should look for in planning a power tool shop, and how to lay it out for greatest efficiency. It stresses

safety procedures that will benefit even the experienced workman. Various attachments are shown that will give one tool many uses, thus saving on the total investment. Never before has a book on power tools been written for the home craftsman that provides as much basic information for the novice, and as many down-to-earth work hints for the expert, as "Getting Started with Power Tools." Order your copy today, with a money-back guarantee if not pleased. Send your check or money order to the address below in the amount of only **\$2.50**

CONTENTS

- Ch. 1 - Selecting power tools
- Ch. 2 - Installing power tools
- Ch. 3 - Portable power tools
- Ch. 4 - Operating the circular saw
- Ch. 5 - Band-head techniques
- Ch. 6 - Drill-press operations
- Ch. 7 - Operating the bandsaw
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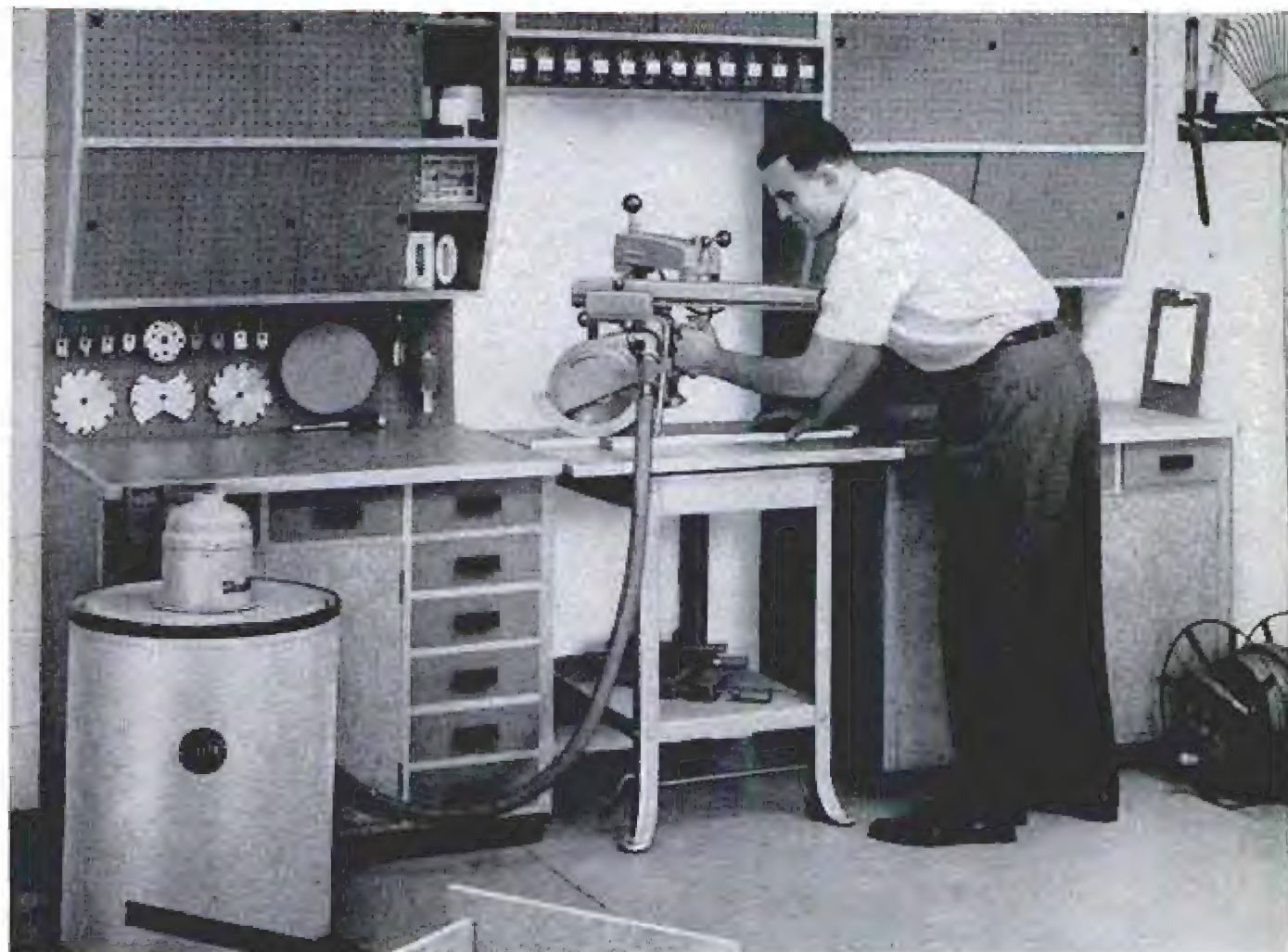
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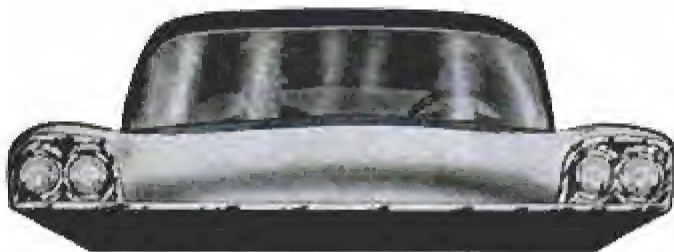
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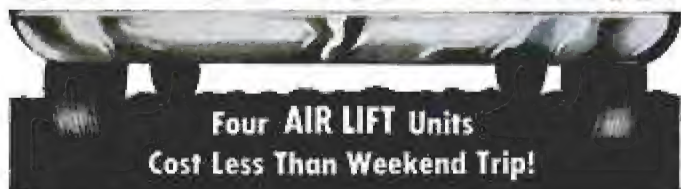
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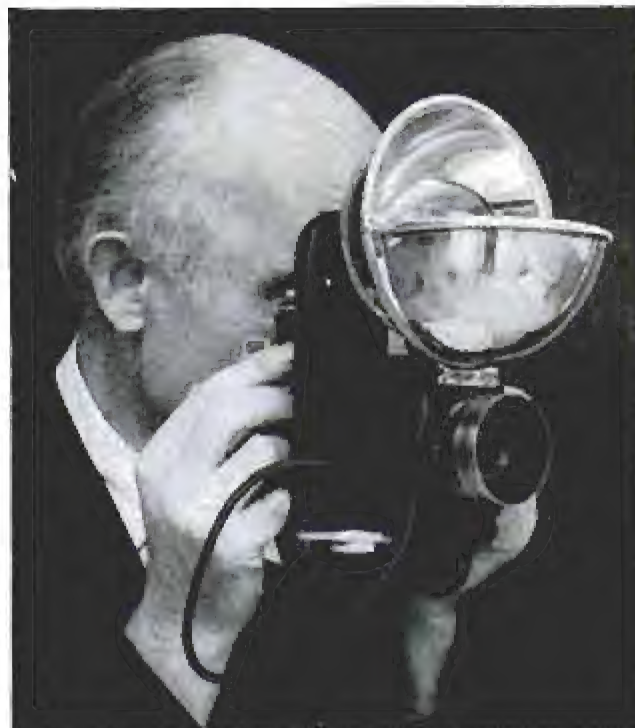
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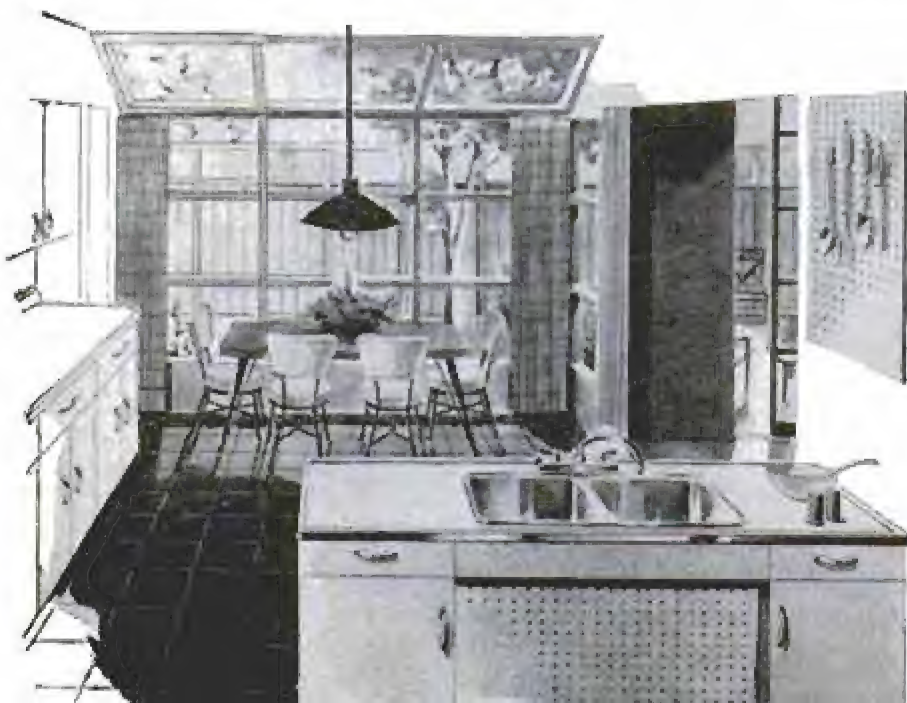
THEY COULD BE WORTH AS MUCH AS \$25,000 TO YOU!

The Home Improvement Council in its national "How's Your Home" Contest is awarding a total of \$125,000 in cash prizes to home owners with the most creative ideas for remodeling, decorating, and modernizing their homes.

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The "How's Your Home" Contest is tailored to the ability and interests of *Popular Mechanics'* home-minded craftsmen readers. We urge you to enter today! To obtain your contest guide write to *Popular Mechanics* using the coupon on page 256. To further assist you in obtaining entry forms, *Popular Mechanics* has placed window displays and contest guides in 3,000 hardware and lumber stores nationwide. These dealers were enlisted to help you enter the "How's Your Home" Contest. Many of these dealers' names may be found on the following pages. Others were published in April; more will appear in our June issue.

To "Better Your Living" and increase the value of your home, plan today to enter the \$125,000 "How's Your Home" Contest.



Check this list, and others in your June issue, for the name of your local Home Improvement Dealer featuring Popular Mechanics Window Displays. He'll have information and entry forms for the \$125,000 contest

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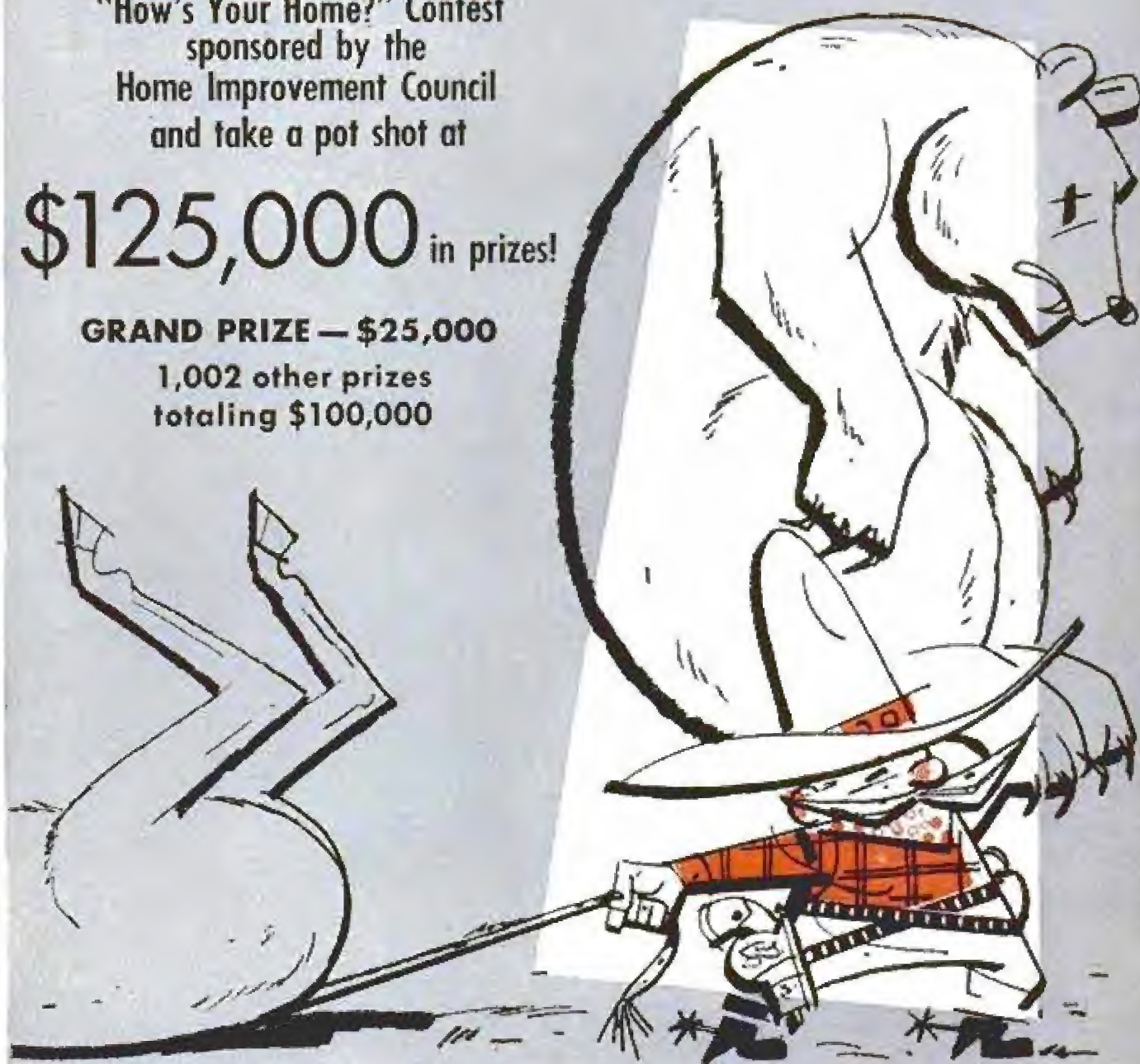
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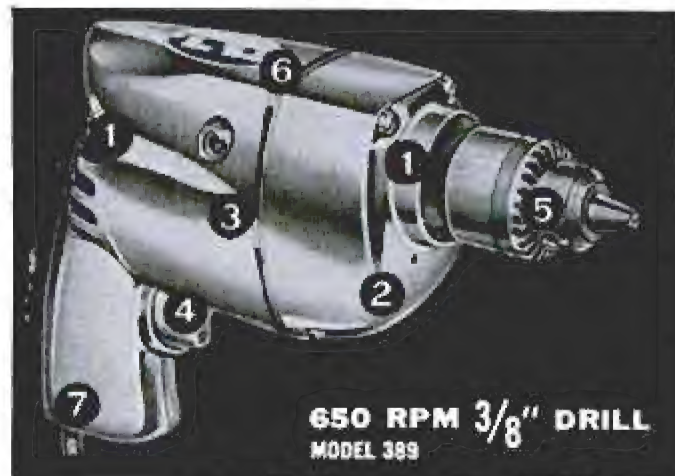
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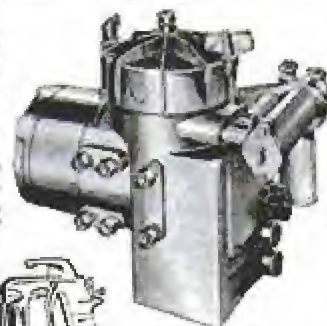


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Now you can use this ONE power-feed shop to turn rough lumber into moldings, trim, flooring, furniture... ALL popular patterns. RIP... PLANE... MOLD... separately or all at once with a one HP motor. Use 3 to 5 HP for high speed output. Fully Safe-guarded. Low Cost... You can own this power tool for only \$30.00 down payment. Write TODAY for Free Catalog
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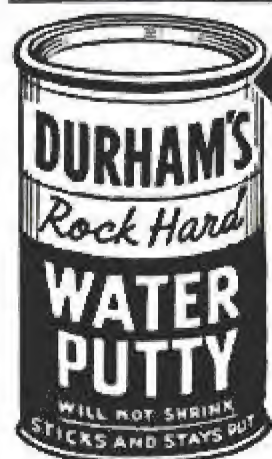
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PERMANENTLY mends cracks
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Does not chip, shrink or fall out.
Easy to use. Economical. Mold
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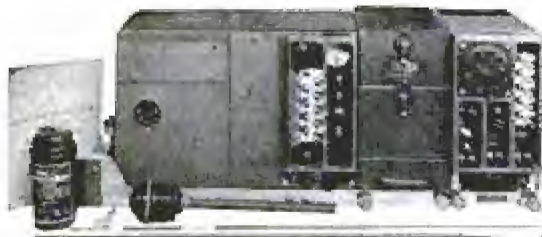
DONALD DURHAM CO.
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Ribbed Plastic Strips Make Waterproof Union

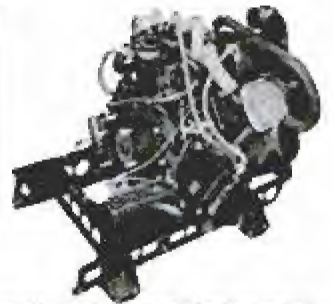
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COMPLETE FM RADIO STATION.....\$79.50 ea.

Brand new 30 watt transmitter and receiver for communications between points up to 30 miles ground wave or thousands of miles reflected wave. Units are Freq. Modulated for low noise interference. Frequencies are selected on any of 10 separate channels in range of 20 to 27.9 mc. Just think you get the receiver, transmitter, antenna, connecting wires, antenna tuning equipment, mount, dynamometers for 24 V DC operation (2-12V car batteries in series); in fact, even spare vacuum tubes and microphone. Of course you can convert for 110V house current or 12V battery operation. Good loudspeaker volume. Comes shipped in 5 original Signal Corps wood boxes. Approx. wt. 400 lbs. Government Cost \$1,200. Yours Brand New for \$79.50 or \$150 for the two sets for point to point communications.

JACOBSEN ENGINES \$5.95 Postpaid (surplus)



Use for Models, Air Boats, Bicycles, etc.

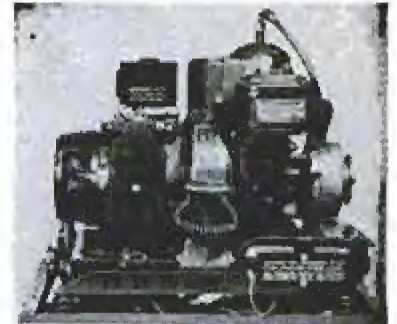
Brand new 2.3 H.P. Jacobsen Basic Engines designed and built for the U. S. Government, at a cost many times this price. Engine Features: 2.3 H.P. @ 3400 RPM; 2 cycle—operates in any position (designed for horizontal mounting); Bore 2"; Stroke 1½"; Crankshaft—roller bearing; Piston—aluminum, 3 ring; Weight—8 lbs. Use your own battery or glo-plug ignition. Two types of carburetors available at extra cost. Single speed carb. \$2.25 each; Tillotson variable speed carb. \$5.75 ea., either postpaid.

Special Purchase to Jobbers of Motorcycle and other air cooled motors. 18 M1 Spark Plugs—Leonard type #6G with air cooling fins. Brand new in moisture wrapping. Govt. Cost \$1.24 ea. Your cost \$17.50 per 100, shipping prepaid.



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Homelite gasoline generator 28.5 V. DC at 2 KW. 3400 RPM motor speed. Electric or rope start. Use to power surplus aircraft radio equipment, cabin or marine power, aircraft starting, etc. These units rebuilt like new by the Air Force and have not been run since. Size 21½" x 24½" x 17½". Wt. 115 lbs. Original AF boxed. Guaranteed. Ship. wt. 210 lbs. "Instruction book included."



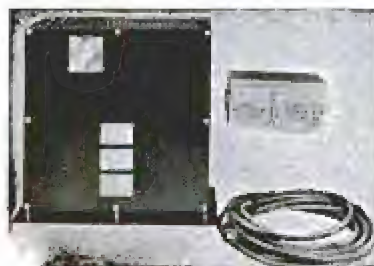
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Automatic Map Making Machine.....\$100.00
Government cost \$3500—Mfgd. by Monroe Calculating Machine Co. and International Business Machines. Used by oil explorers, mining prospectors, Forestry service, and others to automatically draw a map of the terrain over which the vehicle passes. Made to attach to Army or Civilian Jeep but may be used on other vehicles with adaptations. These M-1 Odographs rebuilt by the U. S. Corps of Engineers and guaranteed perfect. Comes with both operation and repair manuals. Machine now selling in excess of \$5,000 by mfg. Order early, quantity limited. Ship. wt. 300 lbs. Only.....\$100 ea.

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Cost Government \$300 ea. Our purchase of large quantity allows this bargain. Ward-Leonard mfgd. Type ED 33510. Charging rates up to 30 amps. on 12-30 volt battery combinations (6-15 cells). Operates from 110 V. D.C. Size 20" wide x 20" high and 10" deep. Shipped in original overseas pack with spares and cord. Wt. 65 lbs. Ship. wt. 145 lbs.

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Within one minute campers can erect a new tent that springs open like an umbrella. The spring-steel frame, without center pole, is built into the tent. Beneath the canvas walls, which can be rolled up, are walls of insect netting. The tent's floor area is 80 square feet and the center height is six feet nine inches.

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• New, powerful ball-bearing gear reduction winch. Built-in reverse switch for instant reverse 1000-2000 lb. pull. Holds up to 40' of 1/4" cable. For wreckers, boats, trucks, trailers, etc. 18" x 9" x 7".

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2 1/2" size . . . 16,500 gph

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Other types, sizes and items. Free catalog.

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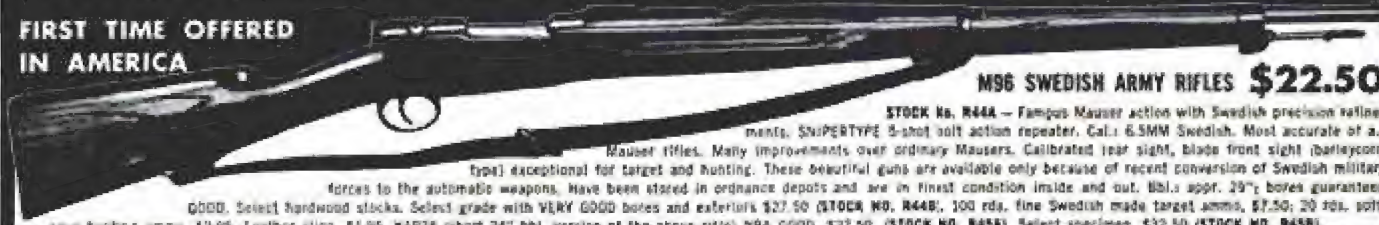
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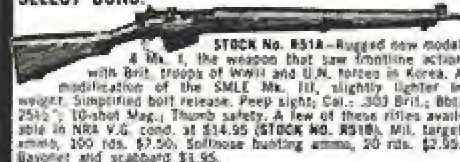


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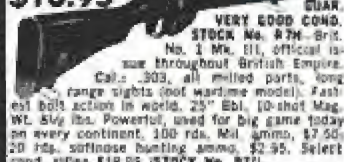
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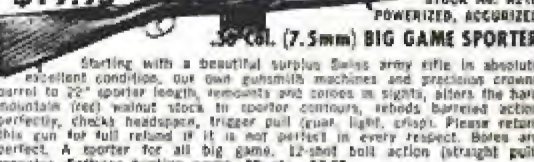
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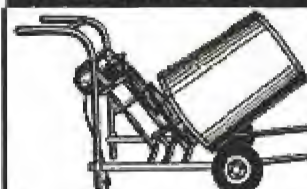
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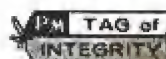


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travel between home and classroom in a
tiny bus mounted on a big tricycle. These
vehicles, called pedibusses, are owned by
the drivers and reportedly are one of the
few forms of private enterprise remaining
in communist China.

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carry traffic across a four-lane express way.

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FAMOUS NAVY MK14 AIR COMPRESSOR

Great for tree, termite, airbrush & paint spraying; filling tires, aquariums, etc. Dual & remote control electric receptacles, 115V 60 cycle AC, heavy duty HP. Westinghouse Motor. Direct drive. Water & explosion-proof. Built-in air filter, adjustable pressure setting up to 47 lbs. 3 cu. ft. per min. Self-contained switch. Mounting brackets. These units made under license of Sperry Gyroscope Co. Wt. 66 lbs. gross. Approx. GOVT. COST \$585. Like NEW. \$21.95.

With portable steel hand cart (shown), rubber wheels, specially constructed for mounting this unit. Incl. 25' rubber air hose. 6' extension cord with plug & fittings. Wt. 76 lbs. Complete with cart—\$26.95.

With new internal-pressure spray gun with 3 adjustable spray tips. 1 qt. can. \$35.95 complete.

HANSEN AIR HOSE QUICK-DISCONNECT COUPLING

ASSEMBLY to fit above unit—a \$5 value—only \$1. All units inspected & checked out in our own shop & guaranteed perfect.

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For beaching boats, winches, hoists. Ideal for motor in golf or boy's electric car. Built-in (removable) DC motor & clutch. Hi torque, 10 speed. Runs on 8-12 or 24 V. Wt. 85 lbs. gross. Approximate GOVT. COST \$300. Like NEW. \$12.00. Matched aplined gear for above—\$3.00 ea.

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Use wherever fluid pumping required. Excellent for hydraulic installations. Has 3/4" pipe connections. Built-in relief valve adjustable up to 1500 lbs. Max. cap. 6 GPM. 1 1/2 H.P. 24 V. motor. Use on 12 to 36 V. Approx. GOVT. COST \$350. NEW. \$10.95.

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Build your own complete make-up package incl. 1 Aircraft DC Gen. 200 Amps. 24 V. Rheostat. Toggle Switch. 1 Ammeter. Electrode Holder. Welder's Shield. 30' New Welding Cable. Voltage Reg. Simple instruction wiring diagram. Wt. under 100 lbs. Approx. GOVT. COST \$475. All units guaranteed pre-tested. \$26.00.

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Jack & Heints or GE. Rated 300 Amps. 24-32 V. With same items as above. Approx. GOVT. COST \$600. Complete 80 lb. kit—\$38.



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Runs on 12 or 24 V. Centrifugal type. Pumps 500 GPH. Complete with on and off switch rheostat, 2 speeds (hi & lo). Mfd. by Ingersoll-Rand. Shpg. Wt. 7 lbs. Approx. GOVT. COST \$195. NEW. \$6.95.



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Contains 500 assorted Dupont Explosive Rivets, 1 set of 9 fractional drills, 1 Butane Blow Torch with extra cartridge—everything needed for blind riveting. Torch can also be used for precision soldering, brazing, etc. 3500° pinpoint flame. Approx. GOVT. COST on rivets alone, \$90. Complete kit \$5.95 ppd.

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Essential wherever blind riveting required. 1/8", 5/32", 3/16", Round & flat heads. Approx. GOVT. COST 32c ea. 1,000 assorted for only \$5.00 ppd.



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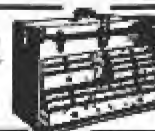
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Here is a steady repeat CASH business you can start in your own basement or garage and make up to \$3 or \$5 an hour in your spare time. You can file all hand saws, also band and crosscut circular saws on the Foley Saw Filer. The adjustments are simple—there is no eye-strain—and you can start right away to turn out perfect cutting saws. Give yourself a raise with a Foley—NOW!

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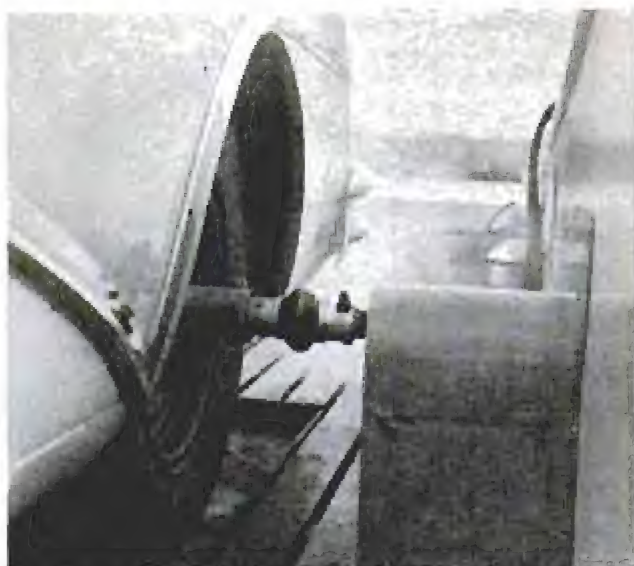
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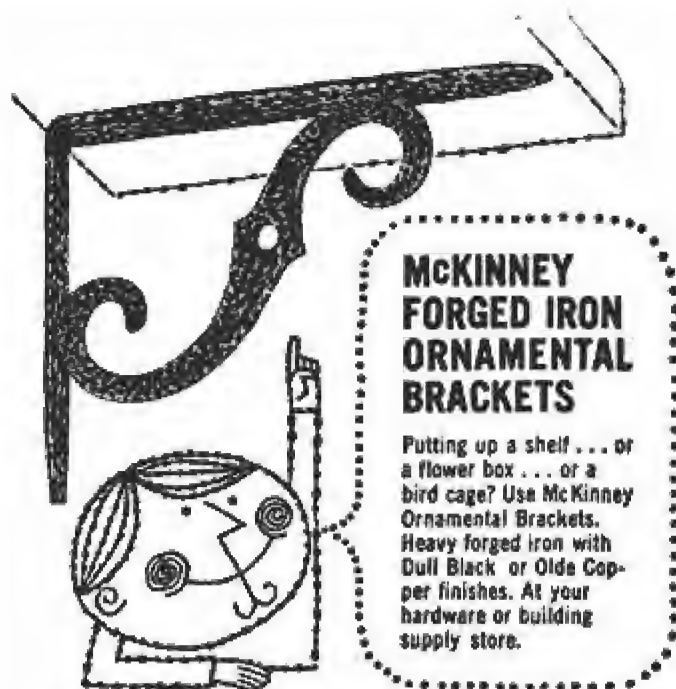
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Center cut type bolt cutter for soft or medium hard rods and bolts, alloy wire, and other metals. Cutting edge has equal bevel on each side for extra strength.

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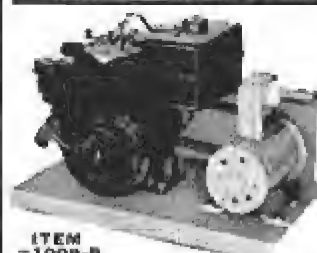
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5.50 2 10.00
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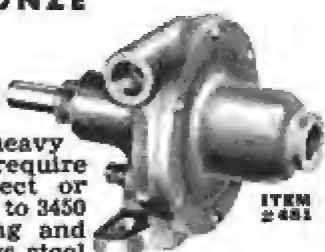
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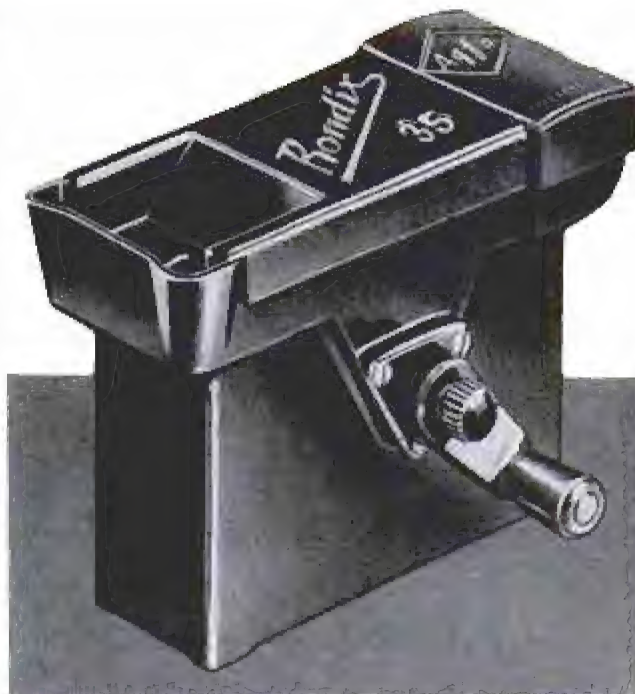
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Manufactured in West Germany for 35-millimeter camera fans is a new daylight developing tank that does not hold the film on a reel. Instead, one end of the film is inserted in a slot in a hub. The film cartridge also goes into the tank and serves as an anchor for the other end. With the tank lid in place, you slowly turn a crank, first clockwise then counterclockwise. This action pulls the film back and forth through the developing chemicals. Since the wet film is naturally slippery, it is not scratched if one section rubs against another.

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Employing a principle of overhead direct radiation, this infrared food warmer uses a fused-quartz element, which transmits 93 percent of input electrical energy. Made of stainless steel, the warmer may be used with its own stand or mounted under a kitchen cupboard.

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1998 Complete with 5-1/2" Blade

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HAS 80 - 120 - 200 - 300 - 400 & 600 POWER MAGNIFICATION WITH ILLUMINATED SUB-STAGE MIRROR and TRIPLE TURNET

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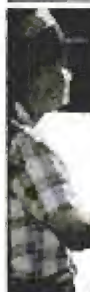
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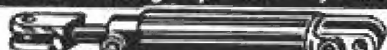


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(Item 21)

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115V. AC

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SCREW TYPE PRESS. Nine ton capacity. See Jan. Pop. Mech's. ad for details—or write. Complete, Wt. 150 lbs. (Item 797) **\$49.50**

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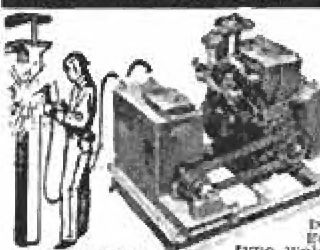


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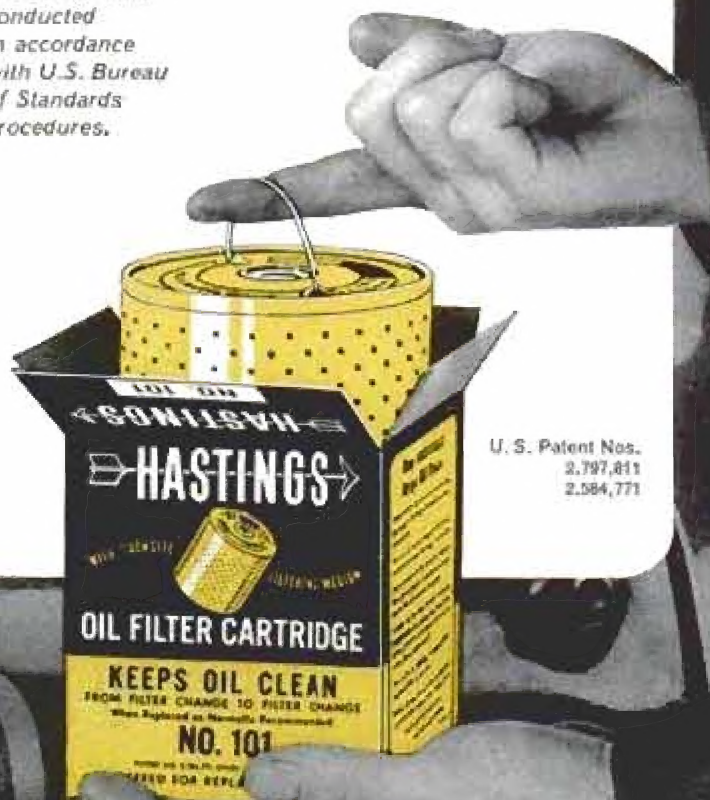
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